August 1982

The independent magazine for the independent user

sinclair user

60p

Issue No 5

GREAT OFFER: £20 off the ZX-81 kit

SUMMER SPECIAL

Giving your Sinclair a break

Rainy day software reviewed

Disaster in Manchester

We profile an award-winning designer

Programming without tears

Spectrums begin to roll

Meet our first Sinclair User Club member

Eight pages of programs, your letters, helpline, mind games

dk'tronics ZX80/81 SPECTRUM Hardware Software

KEYBOARD

Fully cased with numeric pad £45
Uncased with numeric pad £30
Case £15

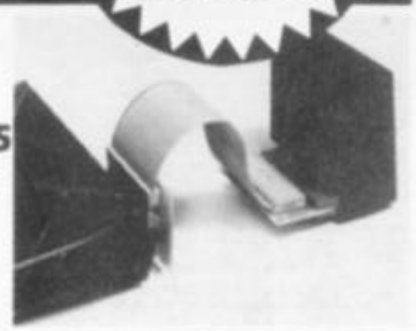
SPECTRUM MEMORY UPGRADE TO 48K £39.95

NEW FROM dk TRONICS

(A) 16K RAM MASSIVE ADD ON MEMORY
FULLY ASSEMBLED AND TESTED **£19.95**
64 K MEMORY EXPANSION £49-95

(B) 4K TOOL KIT FULL OF UTILITIES TO AID THE PROGRAMMER IN CONSTRUCTING AND DE-BUGGING E. PROM VERSION FOR USE WITH GRAPHICS ROM **£9.96**
CASSETTE VERSION **£6.95**

(C) FLEXIBLE RIBBON CONNECTOR (AS ILLUSTRATED) **£10**

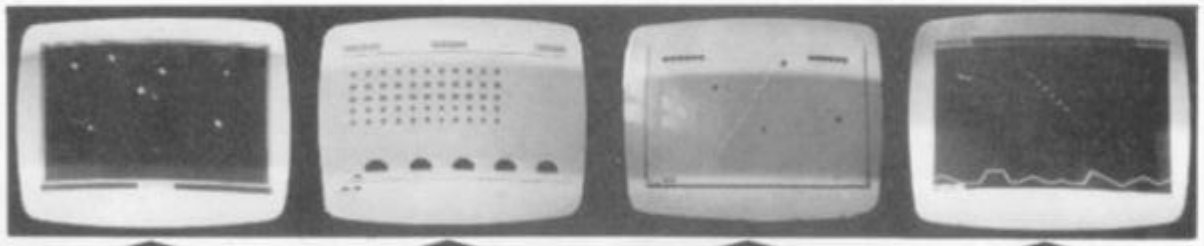


4K Graphics rom

SOME OF THE GRAPHICS NOW POSSIBLE ON THE ZX81

The DK Graphic module is our latest ZX81 accessory. This module, unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready built, fully tested and complete with a 4K graphic ROM. This will give you an unbelievable 448 extra pre-programmed graphics, your normal graphic set contains only 64. This means that you now have 512 graphics and with their inverse 1024. This now turns the 81 into a very powerful computer, with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders graphics and that only accounts for about 50 of them, there are still about 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there; it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder can be fitted with a 1K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets.

£29.95



★ASTEROIDS ★SPACE INVADERS ★CENTIPEDE ★DEFENDER

16K GRAPHICS ROM SOFTWARE

dk'tronics

23 Sussex Road, Gorleston, GREAT YARMOUTH, Norfolk.

Send off the coupon today or telephone Gt. Yarmouth for our answering service (available 24 hrs. a day, 7 days a week) quoting Barclaycard or Access number.
(Please add on £1 for P/P).

ACCESS BARCLAYCARD VISA

Please state type of machine, which ROM memory size, quantity and price when ordering.

Please send me ..... @ £ .....
Please send me ..... @ £ .....
Please send me ..... @ £ .....
Please send me ..... @ £ .....
Please send me ..... @ £ .....
Please add on £1 for P/P. I enclose £ .....
Name .....
Address .....

Cheques/P.O. payable to D.K. Tronics

contents

sinclair user

Editor
Nigel Clark

Consultant editor
Mike Johnston

Production editor
Harold Mayes MBE

Design
William Scolding

Editorial director
John Sterlicchi

Advertisement director
Simon Horgan

Advertisement manager
John Ross

Editorial/production assistant
Margaret Hawkins

Managing director
Terry Cartwright

Chairman
Richard Hease

Sinclair User is published monthly by ECC Publications Ltd. It is not in any way connected with Sinclair Research Ltd.

Telephone
All departments
01-359 7481

If you would like to contribute to Sinclair User, please send typed (or beautifully hand-written) articles or programs to:
Sinclair User
ECC Publications,
30-31 Islington Green,
London N1 8BJ

We will pay £10 for each program printed and £50 for each article, which should be approximately 1,000 words long.

© Copyright 1982

Sinclair User
ISSN No. 0262-5458
Origination by
Outline Graphics.
Printed by
Eden Fisher (Southend) Ltd

Distributed by
Spotlight Magazine Distribution Ltd,
1 Benwell Road,
Holloway,
London N7
01-607 6411

5 SINCLAIRVOYANCE We look at how micros can boost the enjoyment of holidays in the future.

6 HOLIDAY PROBLEMS Do ZX-81s become lonely when left behind at holiday time? Nicole Segre considers the difficulties light-heartedly.

9 MATHS GAMES Ian Stewart looks at ways of relaxing with numbers.

13 COMPUTER CAMP We profile Beaumont Computer Camps, where children can learn about new technology in the Lake District.

14 SOFTWARE SCENE We concentrate on ways of using your ZX-81 to occupy the hours of poor summer weather.

19 NEWS The Spectrum begins to roll; a disastrous Microfair in Manchester; ZX-81 sales boost in the U.S.; and much more.

21 YOUR LETTERS You tell us what you think about the world of Sinclair computers.

24 COMPACTER ROUTINES George Todorovic considers the problems of data code compression on the ZX-81 by changing the character codes.

27 STARTING FROM SCRATCH Our regular feature on how to begin using your ZX-81.

29 TOOLKIT ROUTINES In his second article, Phil Garrett looks at more aids for programming.

31 PROGRAM PRINTOUT Another eight pages of great programs from our readers.

39 ZX-99 Stephen Adams reviews this major piece of hardware from Data-Assette.

43 HARDWARE WORLD Our regular look at what is new in the peripherals market.

45 MIND GAMES Philip Joy and more of the games which test your mind.

47 HELPLINE Andrew Hewson answers your problems this month about the display file on the ZX-81.

50 MOVIES Jack Knight describes easy ways in which to include moving graphics into your programs.

55 INSIDE SINCLAIR Claudia Cooke interviews Rick Dickinson, the award-winning designer of the ZX-81 and the Spectrum.

59 COMPETITION Cricket is the theme for this month's contest for the last of our printers.

61 SINCLAIR USER CLUB We speak to the first club member and there are three special offers for members of our ever-growing user club.

63 SPECIAL OFFER ZX-81 kits for £29.95 plus postage and packaging — A saving of £20.

66 ADVERTISEMENT INDEX Your guide to the many items advertised in the pages of *Sinclair User*.

NEXT MONTH

- **Special Education Edition — We look at the uses for Sinclair machines and the growing amount of software available.**

MELBOURNE HOUSE • ZX81 • SPECTRUM

Why is this man smiling?

You'd be smiling too if you were Dr. Ian Logan.

Dr. Logan is shown receiving the Rosetta Stone Award for his perceptive insights into the way the ZX81 ROM operates. Melbourne House are proud to be the publishers of Dr. Logan's books.

Melbourne House are Sinclair specialists, publishing books that are winners in every category. Whether you are a beginner or an experienced programmer, you'll need Melbourne House books.

If you've got a Spectrum on order (or better yet, if you've already got your Spectrum), then you'll be glad to know that Dr. Logan is working on **Understanding Your Spectrum**, sure to become the definitive book on the Spectrum.

So if you want to smile like Dr. Logan, you can do one of two things: Order one of our books from your bookseller or fill in the coupon and really understand your Sinclair, or you can write a great book or program and send it to us. Who knows? Your smile may be in this ad. next year!

- O **Machine Language Made Simple For Your Sinclair**, £8.95
- O **Understanding Your ZX81 ROM**, by Dr. Ian Logan, £8.95
- O **ZX81 ROM Disassembly Part A**, by Dr. Ian Logan, £7.00
- O **ZX81 ROM Disassembly Part B**, by Dr. Ian Logan and Dr. Frank O'Hara, £8.00
- O **Not only 30 Programs for the ZX81: 1K,** £6.95
- O **The Complete Sinclair ZX81 Basic Course,** £17.50

Orders to
Melbourne House Publishers,
131 Trafalgar Road,
Greenwich
London SE10

Correspondence to Glebe Cottage,
Station Road, Cheddington,
Leighton Buzzard,
BEDS LU7 7NA

☐ Please rush me your new Spectrum/ZX81 catalogue. (Please specify.)
☐ Please send me books as marked above. Note: Please add 80p for post, pack & VAT.

Name .....

Address ..... Postcode .....

MELBOURNE HOUSE • ZX81 • SPECTRUM

Portable systems can boost outdoor thrills

IT IS a bleak winter's day in the hiatus between Christmas and New Year a few years in the future. The thoughts of the family Typical-Sinclair-User stray from the usual feast of old films and Christmas spectaculars on television to visions of sun, sea and sand.

They switch off the television, attach their latest Sinclair machine, bought from one of the many high-street stockists, add their Martochoice Prestel adapter and turn to the Prestel holiday pages.

Following the eventual development of the adapter for the Sinclair machines, Prestel enjoyed a boost in the number of domestic users. A full range of holiday operators have since found it worthwhile to give details of their holidays all over the world.

The Typical-Sinclair-Users select a group of holidays in which they are interested and request more details. Those arrive on the screen immediately and are printed-out. Pictures of the resorts and the facilities arrive through the post a few days later.

From those, the TSUs decide. Unfortunately when they try to book, again through Prestel, they find their first choice of time, destination and operator is fully-booked. They bring their second choice to the screen and find there are vacancies. They make their booking, paying the deposit by debiting their bank account

directly by Prestel. Once that is done, a bill for the balance and a listing of the holiday details arrives on the printer.

As the time for the holiday approaches the TSU family, between playing the latest game of aliens and keeping their household accounts in order, check the weather conditions at their chosen resort and the strength of the peseta against the pound — all available through Prestel.

As the TSUs hate shopping, having to push their way through the crowds, they decide to buy all their holiday clothes and equipment by mail order, again using Prestel.

Their tickets finally arrive, printed on the ingenious micro colour printer developed by Sinclair Research. That add-on had been produced in response to a number of attempts by other companies to make something which allowed a record to be kept of the Spectrum displays and the claim by a number of people that not even Clive could produce a colour printer at a reasonable price.

Pausing only to cancel the milk and *Sinclair User* — by Prestel, of course — switch off the Sinclair-controlled air-conditioning system and transfer control of the home security to the neighbours' Sinclair so that they can look after the house, the Typical-Sinclair-Users begin their great adventure.

The luggage consists of the usual suitcases but also includes a large black briefcase. When they arrive at the airport, they find many other families have the same black briefcases. All are treated with great care, are taken inside the aircraft as hand luggage and stored carefully under the seats.

They arrive in Majorca, everyone still taking great care of their black cases. On reaching their hotel everyone immediately rushes to their rooms, where the secret of the black box is revealed. Inside there is a complete Sinclair computer system, neatly packed in plastic foam. The VDU is one of the Sinclair flat-screen televisions and it is powered by a light but powerful battery developed as part of the Sinclair electric car project.

The following day the TSU family goes to the beach and, in common with many others, they take their briefcase and spend half the day enjoying the sun, sea and sand and the other half playing with the Sinclair.

The case also contains a device which allows the Typical-Sinclair-Users to contact their neighbours via the telephone service or collect any recorded messages on their telephone answering service.

If this sounds a little far-fetched, as though the Sinclairvoyance crystal ball is even less clear than usual, consider that most of the items are already in existence and are available either for the Sinclair machines or can be adapted from hardware available with other computers. The two items which do not exist are the colour printer and the lightweight battery but that is no guarantee that they will not appear on the market.

The rest of this look into the not-too-distant future depends on how people react to the possibilities provided by a light, fully-portable computer system. It may be a little unreal to suggest that people will take every opportunity to avoid leaving their homes. It would be pleasant to think that the gregarious nature of people would rebel against being cut off from their fellow human beings.

The enthusiasm with which many take any opportunity to cut themselves off and carry around their own little world, however, would appear to argue against this. It is one of the reasons why cars are preferred to public transport and why growing numbers of people can be seen walking around with headphones listening to small cassette players.

Do Sinclair machines get lonely being left at home during summer holidays? Nicole Segre considers the problem.

Taking the pain out of holiday separation

ENJOYABLE though it may be for some, holiday time has always brought its special problems. I do not mean only dilemmas such as what one wears — if anything — in St Tropez, or for hang-gliding over the Niagara Falls, or for whatever other delights one has in store. I speak of real anxieties such as who will water the plants.Even if the cat could be persuaded to do it, who will feed the cat? How will the burglars be lured into thinking that three burly men are in residence when the whole street looks more dead than John Cleese's Norwegian blue parrot?

Now, to add to all that, there is a new problem — what happens to my son's ZX-81? I realise how silly it sounds but I have to confess that I have wondered whether it would be all right on its own. Would it rust? Or do chips go stale for lack of use? Would dust get into its nooks and crannies and make it behave strangely, like something taken-over by beings from outer space? Would Alex on his return from holiday be wandering about saying: "I know you think I'm crazy but that is not my computer. It looks like my computer but something has happened to it. It is not my computer".

Have I been watching too many late-night films? Do computers have feelings? Should I ask someone to come each day not only to feed the cat and water the plants but to dust the computer and talk to all of them,too? Last but not least, how would my son cope with the strain of a whole summer unrelieved by a single game of Monster Centipedes or Asteroids' Revenge — I do hope I have those names correct. Will that American university, which gave us Rubik's thumb and Clacker wrist, discover another ailment associated with popular pastimes? ZX addiction perhaps, or more likely Sinclair Eye. I can imagine thousands of people wandering around wearing dark glasses on even the dullest day as they walk for the first time in the open air for some months, their hands twitching as they suffer withdrawal symptoms from using the keyboard.

I need not have worried, though, and I feel much better about it after a brief talk I had with Keith Hall. I should explain that he is responsible for all the computer madness, or Sinclair Syndrome, in our household. He introduced my son to the ZX-81 by starting a computer club at his school. I hasten to add that in every other respect he is a splendid chap.

> 'No longer need Sinclair users endure long weeks of computer deprivation; they can take their computers with them.'

He told me that one reason the Sinclair is so eminently suitable for school use is that its keyboard, which many of us agree is maddening to use, is also very resistant, able to withstand spilt drinks and countless sticky fingers, never mind a little bit of dust. In fact, one ZX-81 has even been run from a car battery in a muddy back garden, without ill-effect.

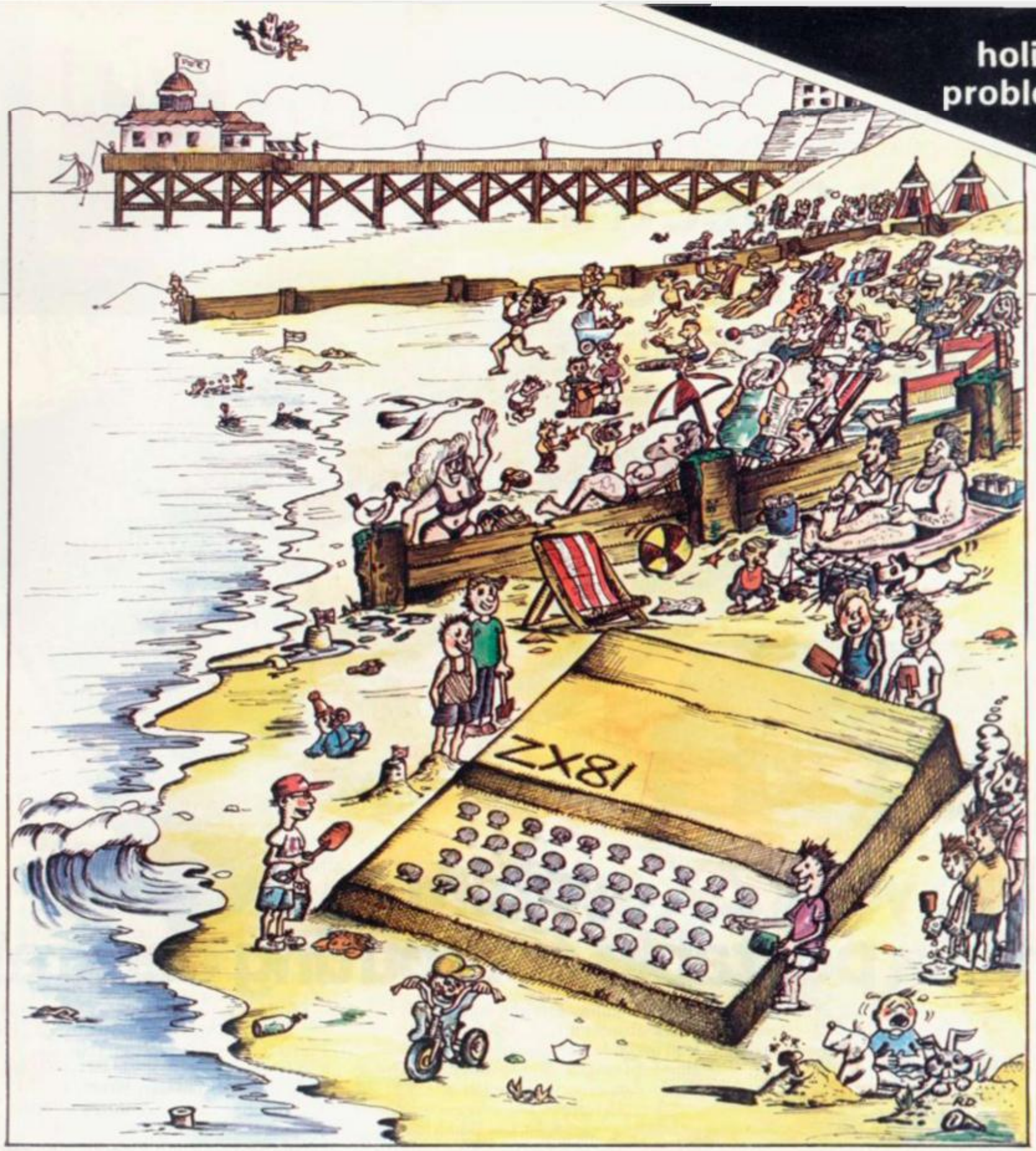
Further, it appears that my oft-repeated complaints about the Sinclair never doing anything useful are completely unfounded. According to Hall, with the necessary modifications and appendages — I will not go into all the technical details as I do not want to confuse you — the Sinclair can be made to do almost anything. Even feeding the cat and watering the plants, I dare say, although I would not trust it to know which was which and certainly not to speak to them pleasantly.

This opens-up an interesting possibility. No longer need Sinclair users endure long weeks of computer deprivation; they can take their little computers with them. While those of us with more old-fashioned tastes splash about in the waves or walk through breath-taking scenery, they could be sitting within wire's reach of a car engine, eagle eyes trained on a screenful of moving blobs, astounding the locals by their skill and by the amazing advances of British technology.

It could be the start of a completely new way of spending holidays. Beach computer clubs could spring up in the resorts of Europe — or more likely car park computer clubs. Parents could be seen rushing into the sea to rescue machines caught by an unexpected wave. Sand-castle competitions would be a thing of the past, replaced by attempts to make the highest score on the car race game.

Perhaps they could even find ingenious new tasks for their computers to perform — testing the temperature of the water, perhaps, or acting as mosquito early-warning systems. It would be a simple matter

holiday problems



to store a few useful foreign words and phrases such as "Where is the nearest football stadium?" or "I would like to speak to the head waiter".

On second thoughts, it all seems a little impracticable. If you took your computer on shopping trips to display requests like "Please give me the yellow one", you would not be able to carry your shopping.

A trip to the beach would go like this: "Do you have your swimsuits? Towels? Beach mat? Parasol? Ball? Frisby? Sunglasses? Camera? Binoculars? Radio? Computer? Television set?" Somehow, I do not see it. Besides which, even if there is room to pack a computer on the outward journey, there would not be on the return, following that well-known phenomenon by which suitcases always become smaller on holiday, or the contents grow bigger — it has not been proved conclusively either way.

Alternatively, I send Alex to one of those computer camps, the Butlins of the micro world, where he can enjoy outdoor activities as well as crouching over his computer. I suppose that is intended to make him physically fit enough to be able to spend the rest of the year wth his Sinclair without too many ill-effects.

The more I think about it, though, the more I think this is getting out of hand. Our lives are not to be ruled by a small plastic box, no matter how full it is of electronic marvels. The last few months have been bad enough, without it deciding how we should enjoy the brief days of good summer weather.

I am going to put my foot down firmly and oppose any moves to take a Sinclair away with us this year. A break with the trappings of civilisation will do us all a world of good. Enough of flickering screens, moving targets and exploding galaxies — we shall restore ourselves with fresh air, sunshine and bird-song.

Now if you will excuse me, I must go and pack. If I hurry, I might even have time for a quick game of Colliding Space Intruders, as it will be a long time before I have the chance again.

Use your computer in the case...
Foam rubber gives complete protection...
Purpose-built for the ZX system...

ZX81 & Spectrum Custom Cases.

Just £34·95 (+ P&P) each.

Turn your ZX system into a portable computing centre!

Your ZX hardware – ZX81 or Spectrum – is designed to work together as a system.

And now there's a simple way to make the most of the fact.

The portable computing centre in a briefcase.

A ZX Custom Case holds all your hardware in the most ergonomically sensible positions for easy operation. Each piece of equipment is gripped securely by shock-absorbing foam. Each connecting lead fits under the foam, so there's no chance of tangles. And as each piece is held firmly, connections are excellent.

You can forget wasted time setting up or unhooking the system, too. When you've finished, simply tuck in the mains and TV leads and replace the hinged, lift-off lid. And of course, if you're taking your ZX system to college or the office, ZX Custom Cases are a lot less cumbersome than a bag or rucksack. And a lot more protective and professional.

ZX Spectrum Custom Case now available!

Designed by ZX enthusiasts – for ZX enthusiasts.

Both the ZX81 and Spectrum Custom Cases were designed by a group of ZX system users and manufactured by Britain's leading case makers. Made from impact-resistant ABS, each case holds every piece of Sinclair hardware available for the respective computers – plus Learning Lab, manual, software cassettes and any cassette player up to 10½" x 5½". If you haven't all the hardware, simply leave the pre-cut foam in position, then remove it as you get extra pieces of equipment.

And when brand new hardware is introduced, or you upgrade from ZX81 to Spectrum, simply contact us for a replacement foam insert for just £4.95 (+p&p).

Send for your ZX Custom Case – now!

ZX81 and Spectrum Custom Cases are guaranteed for two years, and cost just £34.95 (+p&p) each. Remember you could pay more for an ordinary briefcase.

To order, simply use the FREEPOST coupon. Or if you have a credit card, telephone 0276 62155, Mon-Fri, 9.30-5.30.

COMPUTEX CASES

Computex Cases (JBS), Stanhope Road, Camberley, Surrey, GU15 3PS.

Please allow 28 days for delivery. 14-day money-back undertaking.

To: Computex Cases (J B S), FREEPOST, Camberley, Surrey, GU15 3BR.

Please send me _____ (qty) ZX81 Custom Case(s) at £36.95 (inc. £2.00 post, packing, insurance) each. **01.**

Please send me _____ (qty) Spectrum Custom Case(s) at £36.95 (inc. £2.00 post, packing, insurance) each. **02.**

*I enclose a cheque/P.O. for £_____ made payable to Computex Cases.

Please debit my Access/Visa* account no. _____

*Please delete as appropriate. PLEASE PRINT.

Signature _____

Name: Mr/Mrs/Miss _____

Address _____

_____

_____

Reg. in England no: 991288. SUS 208

Relax with a pretty number pattern

Ian Stewart looks at a rewarding way in which to spend a few hours playing with number series and loops

MATHEMATICIANS call it iteration — repeating a process over and over again to see what you get. Which means, fancy names notwithstanding, that it should be easy meat for a computer. Because, after all, doing the same thing over and over again is what computers do best.

I do not mean exactly the same thing, of course — not like the student who was asked. "What do you get if you add 3 to 40 three times?" and who replied "I get 43 every time". I mean the same process but using the result of one stage as the starting-point for the next.

For instance, suppose the process is "add the digits". If we start with 479, then adding the digits gives 4 + 7 + 9 = 20. Now iterate, by adding the digits of that: 2 + 0 = 2. Iterate again, well; it is 2 + nothing else, that is 2 again. So we are stuck at 2. It is reasonably easy to see that whatever number with which you start you will eventually get down to a one-digit number, and stop. So that is not worth taxing the poor old ZX-81 brain.

What if we add the squares of the digits? Then 479 would lead to 4*4 + 7*7 + 9*9, or 16 + 49 + 81, which is 136 — well, 146, I made a mistake; and that — well, perhaps the ZX-81 is good for something after all. Let us write a small program to do the iteration for us:

```
10 INPUT N
20 PRINT AT 19,0;N
30 LET A = 0
40 LET M = INT(N/10)
50 LET A = A + (N-10*M)*
   (N-10*M)
60 LET N = M
70 IF M = 0 THEN GOTO 90
80 GOTO 40
90 PRINT AT 20,0;A
100 SCROLL
110 LET N = A
120 GOTO 30
```

See what it does? You give it the starting number N. It uses A to add the squares of the digits — those (N-10*M)s are the digits — and prints it out; SCROLLs to make room for the next step; then sets N equal to the result A and goes back to line 30 to start all over again, iterating like mad.

Type it in; try a few values for N. It will go on forever unless you hit BREAK, but keep watching — perhaps you will notice a pattern.

What happens eventually is that the numbers settle down to some kind of regular behaviour but it can be a surprising one. For instance, try N = 89. You will get, successively, 145, 42, 20, 4, 16, 37, 58, 89. The iterations brought us back to

continued on page 10

continued from page 9

where we started and the silly beast is going round in an endless loop. You will find that many starting values for N lead into the same loop. That is interesting, really; you would not have guessed it initially. Some numbers do not get into that loop, though; try N = 7 as a starting point. You can have plenty of fun trying different starting values and comparing the way the numbers evolve.

If squares are not for you, perhaps you would prefer cubes? Thanks to Professor Rubik they are fashionable but our cubes are things like 2*2*2 = 8, or 3*3*3 = 27. Just modify line 50 of the program to read

```
50 LET A = A + (N-10*M)*
   (N-10*M)*(N-10*M)
```

and proceed as before. This time there is a new surprise — the number 153 goes to itself. There are some other numbers which equal the sum of the cubes of their digits; can you find them? On the other hand there are some loops, too; for instance

133 → 55 → 250 → 133 → . . .

Insert yet another (N-10*M)* in line 50 and you have fourth powers. Here is a nice loop, too:

4514 → 1138 → 4179 → 9219 → 13139 → 6725 → 4338 → 4514 → . . .

Fifth powers? You should be able to work out the modification to the program by now. There is a loop of length four:

10933 → 59536 → 73318 → 50062 → 10933 → . . .

Experiment with different powers and different starting-points N. It is a relaxing way to spend a few hours and there are plenty of patterns to spot. The one general thing which is known is that from whatever number you start, you must eventually end in a loop, or with a number which goes to itself, forming a loop with only one number in it.

Essentially that is because if you start with a big enough number the sum of the powers of its digits has to be smaller; so the numbers keep shrinking until they are trapped in a limited range. Once there, they hop around and since they cannot keep going to different values forever, there being only a limited range available, something has to repeat.

There is one amazingly simple iteration process about which nothing of the kind has ever been proved, even though most people think it must be true. It is called the *Kakutani Problem*. The iteration process is:

If N is even, halve it.

If N is odd, treble it and add 1.

Problem: does everything end in the loop 1 → 4 → 2 → 1 → . . . ?

Here is the program:

```
 10 INPUT N
 20 LET C = 0
 30 PRINT AT 20,0; N
 40 SCROLL
 50 IF N = 2*INT(N/2) THEN
    LET N0 + N/2
 60 IF N <> 2*INT(N/2)
    THEN LET N0 = 3*N + 1
 70 LET N = N0
 80 LET C = C + 1
 90 IF N = 1 THEN GOTO 110
100 GOTO 30
110 PRINT AT 21,0; "HIT LOOP
IN□";C;"□STEPS"
(□ = SPACE)
```

If you experiment with this, you will find that the behaviour is most irregular. For example, N = 29 hits the loop after 18 stages and so does N = 30; but N = 31 requires 106 steps to reach the loop and the numbers become as big as 1780 on the way. Then 32 stops in only five steps and 33 in 26 steps. The numbers hop around all over the place; they get smaller, smaller — suddenly bigger instead. Could they keep growing forever and miss the loop completely? Nobody knows.

Of course, you cannot decide that on a computer; there is no way to carry-out the computation forever, to see if it keeps growing. You can, however, have a general feeling about the way the numbers behave by trying them. A biggish start, like 1111111, hits the loop after 165 steps. Generally, runs where the numbers shrink tend to occur more often than ones where they grow.

Despite that evidence and an enormous number of computer experiments, the problem remains completely unsolved, which is remarkable, considering its simplicity. It shows that there is plenty of life left in mathematics and that not every problem can be solved just by putting it on the computer. It is also an intriguing example of elusive number patterns and the computer is a valuable aid in finding them.

"...the quality of the colour display is excellent". Popular Computing Weekly.
"The graphics facilities are great fun". Personal Computer World.
"...the Spectrum is way ahead of its competitors". Your Computer.

"The world's best personal computer for under £500."

Chris Sinclair

Sinclair ZX Spectrum
16K RAM £125, 48K RAM £175.

This is the astonishing new ZX Spectrum – a powerful professional's computer in everything but price!

There are two versions – 16K or a really powerful 48K. Both have a full 8 colours, sound generation, a full-size moving-key keyboard and high-resolution graphics. Plus established Sinclair features such as 'one-touch' keyword entry, syntax check and report codes!

Key features of the Sinclair ZX Spectrum

Full colour – 8 colours plus flashing and brightness-intensity control.

Sound – BEEP command with variable pitch and duration.

Massive RAM – 16K or 48K.

Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.

High resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.

ASCII character set – with upper- and lower-case characters.

High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY and MERGE for programs and separate data files.

The ZX Printer – available now

The printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

ZX Microdrive – coming soon

Each Microdrive will hold up to 100K bytes on a single interchangeable microfloppy – with a transfer rate of 16K bytes per second. And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum – they're available later this year, for around £50.

How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day.

BY FREEPOST – use the coupon below. You can pay by cheque, postal order, Access, Barclaycard or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

sinclair
ZX Spectrum

Sinclair Research Ltd,
Stanhope Road, Camberley, Surrey, GU15 3PS. Tel: Camberley (0276) 685311.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing orders under £100	28	2.95	
	orders over £100	29	4.95	
			TOTAL £	

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £_____

*Please charge to my Access/Barclaycard/Trustcard account no. Please print

*Please delete/complete as applicable

Mr/Mrs/Miss

Address

FREEPOST – no stamp needed. Prices apply to UK only. Export prices on application. SUS 808

ZX81 GAMES

from

J.K. GREYE SOFTWARE LTD

THE NEW GENERATION SOFTWARE HOUSE

"Without question the finest machine code games available today".....J.N. ROWLAND Product Manager for W.H. SMITH

GAMESTAPE 1 for 1K _____ **only £3.95**
10 Games incl. ASTEROIDS, UFO, CODE, BOMBER, GUILLOTINE, KALEIDESCOPE, etc.
PROBABLY THE BEST VALUE 1k TAPE AVAILABLE.

We've done in 1k, games which some of our competitors require 16k to do!

GAMESTAPE 2 for 16K _____ **only £3.95**
***STARFIGHTER** Superb machine code Space Battle. Set against a background of twinkling stars, with stunning explosions — if you can hit the enemy!
PYRAMID Can you move the Pyramid? Make a mistake and it will collapse! A Thinkers game.
ARTIST The ultimate Graphic Designers aid. 8 Directions, 10 Memories, SAVE, COPY, RUBOUT, CLS, etc.

GAMESTAPE 3 for 16K _____ **only £4.95**
***CATACOMBS** A Multi-Level Graphics Adventure. Each level can contain up to 9 Rooms, 8 Passages, 7 Monsters, Food, Gold, Traps, Phantoms, an Exit (to the next level), and there's an infinite number of levels.
NOTE..... This is NOT one of the necessarily limited text Adventures as sold elsewhere.
"An excellent addictive game which will keep you amused for hours"..... *COMPUTER & VIDEO GAMES.*

GAMESTAPE 4 for 16K _____ **only £4.95**
***3D MONSTER MAZE** The Game to Top All Others. Unbelievable Graphics! Can you find your way through the Maze? The EXIT is there somewhere, but then so is a T.REX, and its after YOU! All in 3D (the T.REX will actually run towards you in full perspective!), you've never seen anything like this before!
"3D MONSTER MAZE is the best game I have seen for the ZX81"..... COMPUTER & VIDEO GAMES
"If I had to choose just one programme to impress an audience with the capabilities of the ZX81, then J.K. Greye's 3D MONSTER MAZE would be the one without doubt"..... ZX COMPUTING. *"Brilliant, brilliant,brilliant!"*.....*POPULAR COMPUTING WEEKLY*

GAMESTAPE 5 for 16K _____ **only £4.95**
***3D DEFENDER** The Ultimate Space Game. Super fast Machine Code 3D version of the Arcade favourite. You have to save your home planet from the marauding Alien Spacecraft. This is all in 3D, your viewscreen shows you the view out of your fighters cockpit window. The backdrop moves when you turn, or fly up or down (8 flight directions), just as if you were really flying it! But then YOU ARE! The Enemy Saucers will actually zoom towards you in 3D, and shoot you if you let them!! Your display includes Score, Shield Strength, Altitude, Proximity, Forward Radar and your viewscreen, which shows your rotating home planet, backdrop of Stars, Meteors, Explosions, Plasma Blasts, your Photon Beams, up to 4 Enemy Saucers and of course its all in full 3D!
A SMASH HIT at the ZX Microfair (most of the other software houses wanted a copy!, a game not to be missed!

GAMESTAPE 6 for 1K _____ **only £1.95**
***BREAKOUT** Super Fast Full Screen Display Game. Your all time favourite with an added twist. See how much Money you can win and watch the pounds convert to Dollars. All in Machine Code for Fast Action with 3 Speeds, 2 Bat Sizes and three angles of rebound! The best BREAKOUT around and at this price you can't go wrong!

GAMES MARKED * INCL. MACHINE CODE.
Prices include VAT and U.K. P. & P.
(Add appropriate Postage on Foreign Orders). Cheques/P.O.s to

J.K. GREYE SOFTWARE LTD

Dept.SU, 16 Park St., Bath, Avon BA1 2TE.
CREDIT CARD SALES: Phone: 01-930 9232 (9 a.m. - 7 p.m.)
FOR INSTANT DESPATCH

If you prefer to see before buying, our range of **GAMESTAPES** are stocked by the following stores.

BUFFER MICROSHOP	347A Streatham High Rd., London SW16;
GAMER	24 Gloucester Rd., Brighton;
GEORGES	89 Park St., Bristol, Avon;
MICROSTYLE	29 Belvedere, Lansdown Rd., Bath, Avon;
MICROWARE	131 Melton Rd., Leicester;
SCREEN SCENE	144 St. Georges Rd., Cheltenham, Glos;
W.H. SMITH	Over 200 Computer Branches;
ZEDXTRA	5 School Lane, Kinson, Bournemouth, Dorset;

TRADE & EXPORT ENQUIRIES WELCOME

OCCAM BOOKSHELF

PEEK, POKE, BYTE & RAM **£4.95**
by Ian Stewart & Robin Jones
A gentle introduction to the ZX81 & its capabilities.

NOT ONLY 30 PROGRAMS/SINCLAIR ZX81:1K **£7.25**
Games, Utilities and Mathematics, with a listing of and discussion on each program.

UNDERSTANDING YOUR ZX81 ROM **£8.95**
By Dr. Ian Logan
The Z80 Microprocessor, its machine code, and how to use machine code subroutines in BASIC programs.

ZX81 ROM DISASSEMBLY: PART A **£6.95**
by Dr. Ian Logan
A complete disassembly of hex. locations 0000 to OF54 with a commentary on each subroutine. A companion reference book to Understanding Your ZX81 ROM.

ZX81 ROM DISASSEMBLY: PART B **£7.95**
A continuation of the above, for locations OF55 to 10FF.

MACHINE LANGUAGE PROGRAMMING MADE SIMPLE **£8.95**
Discover the internal mysteries of the Sinclair, and learn to communicate with it in its own language.

COMPLETE SINCLAIR ZX81 BASIC COURSE **£16.95**
A guide to every facet of ZX81 BASIC, including an 80 page reference to the BASIC statements and functions, with explanations and short example programs.

ALL PRICES INCLUSIVE OF VAT & SHIPPING WITHIN THE U.K.
Occam Software, 13 Hawthorn Grove, Wilmslow, Cheshire, SK9 5DE, England. P.S. Sheard.
Telephone: Wilmslow 524228.

Great games packs for 16K ZX81

Pack 1

ASTRO-INVADERS

Just look at these features . . .
. . . then look at the price!

*Superior machine code programming
*Rapid-firing with explosive on-screen kill effect
*High-scoring saucers *54 aliens *accelerating attack
*Destructable defence shields *On-screen kill count
*High-score update *Fast action space graphics
— a new dimension in ZX81 value

Astro-Invaders is yours on cassette for **ONLY £3.65** with **FOUR BONUS GAMES: ARCADE GRAND-PRIX** — drive four levels of machine code skill **PENALTY** — defend your goal against the sharp-shooting ZX81 **GOLF** — judge shot-strength, angles, bunkers . . . plus machine code insect fun with **SWAT**

Pack 2

PLANET DEFENDER

— blast aliens in planet orbit . . .

*ultra-dynamic machine code action *hostile alien-waves *fast responsive controls: ship up/down, thrust, laser-bolt, and smart bomb *comprehensive scoring
*explosive graphics . . . . . explosive price!

Planet Defender comes on cassette for **ONLY £3.95** with machine code **STORM-FIGHTERS** — combat 5 fleets of swooping aliens as you blast through space, **BREAKOUT** (machine code) — race against the clock, plus **GRAPHIC HANGMAN.**

16K ZX81 cassette packs 1 and 2 are £3.65 each (post free in U.K.). Fast despatch from
John Prince, 29 Brook Avenue, Levenshulme, Manchester, M19.

Computer camps were introduced to Britain last year and proved so popular that they have been expanded rapidly.

Picturesque setting for micro courses

Hundreds of teenagers will this year be able to learn all about the Spectrum and the ZX-81 against the picturesque backdrop of the Lake District. Beaumont Summer Camps has decided to instal a number of the machines at its new residential camp six miles south of Carlisle.

Children between the ages of 10 and 17 are able to enjoy holidays at the camp in which half the day is spent working on the Sinclair machines and the other half can be used to take part in the many other activities available.

According to the organisers, it is assumed that most of the children will have no previous experience of computers of any kind. They say they have "designed a special programme to ensure that the campers' first encounter with a computer is most enjoyable and rewarding experience." They also promise to "de-mystify the computer".

Three levels of instruction are provided to take account of all levels of knowledge. The subjects covered will include how computers work, computer jargon, programming in Basic, possible future applications, and progress to floppy discs, graphics, word processing and other languages.

It is expected that most of the campers will have a working knowledge of Basic programming after two weeks.

The computer course is linked to the other activities available at the camp, which mainly involve moving outdoors and enjoying the magnificent countryside. The camp provides tuition in camping, fell walking, sailing, pony trekking, canoeing and many other activities.

It was the idea of Stewart Wiley, a former holiday tour operator who decided to set up holiday camps for children after he had seen the success of similar camps in the United States.

"When I was on holiday in the States, I saw a television programme about a computer camp which had been started in Santa Barbara, California. I contacted the person who had set it up and he

visited England to advise on the setting-up of a similar camp in Britain," Wiley said.

Last year he opened his first camp at St John's School, Windsor — a day camp with buses taking children from the area to the camp every weekday.

As at the residential camp, the activities included outdoor sports and the opportunity to learn about microcomputers. At Windsor the programme was based on the Commodore Pet. It was not until this year and the decision to set up a residential camp that he became involved with Sinclair machines. They are now the only machines available at the Carlisle camp. At the day centre the courses use Vics and Tandys.

Robin Heath, director of the computer camps, said that one of the reasons for choosing Sinclair machines was that the average age of children at the residential camp would be higher than that at the day centres.

"Younger children can have difficulty with the keyboards on both the ZX-81 and the Spectrum but the average age at the Lake District camp should be about 13 and many children of that age already have ZX-81s and find no problem with them," Heath said.

He added that since the decision they had found the machines to be very resilient and that would be an advantage in being able to withstand the extra use.

"I made the decision to choose Sinclair exclusively because I thought it would be worthwhile for the future to have a close association with the company," said Wiley.

The first venture at Windsor was so successful that Wiley decided on a massive expansion for this year. As well as the Windsor camp and the new Lake District residential camp, there are other day camps being organised at Mill Hill on the outskirts of London, at Sevenoaks, Kent, and Knutsford, Cheshire.

"Last year was very successful," said Wiley. "We had spaces for 300 and could have filled them many times over".

Phil Garrett looks at ways of enjoying your holiday despite poor weather

Greye defender is another 3D winner

IF YOU ARE the type who goes to the seaside to spend hours — and pounds — in amusement arcades, there is a new crop of ZX-81 action games to tempt you to stay at home.

J K Greye, famous for its remarkable **3D Monster Maze**, has scored again with **3D Defender**. This all-machine-code game for 16K ZX-81s has the player steering the last surviving craft of a once noble battle fleet into action against marauding invaders. Using the keyboard like a joystick, you can climb, dive and bank, watch the stars wheel about and the ground slip past, but keep an eye open for the bad guys and their plasma bolts. The game requires quick reactions and good co-ordination — a minimum of five fingers are in action — and takes a good deal of practice before any score is achieved. Amazing graphics effects are created as the enemy draws closer, more and more detail appearing as the flying saucers loom in your forward scanner. Another winner for £3.95.

If you have spent the money you had saved for your RAM pack on your holidays instead, J K Greye offers arcade-game action in just 1K. Its full-screen **Breakout**, written in an incredible 500 bytes of machine code, has all the capabilities of the bigger versions. The bricks are inverse £ signs, which turn into $ signs when hit, and then disappear altogether when hit again. The game has adjustable bat size and speed, plus on-screen scoring and variable rebound angle. All for £1.95 from J K Greye Software, 16 Park Street, Bath, Avon, BA1 2TE.

Taste of exotic from Diggles

ONCE YOU have returned from your two weeks in the European sun, how can you recapture that taste of the exotic? Photographs and souvenirs are all very well but what about food? Your 16K ZX-81 can revive those memorable meals with the aid of **The Diggles Kitchen**. Volume one contains 28 recipes from all over the world — Cyprus chicken, Spanish hake, Italian roast lamb, plus recipes for beef, hare, turkey, duck, ham and many more. If you have had enough of foreign food, you will find Lancashire hotpot and steak and kidney pie included. If you did not go overseas this year, why not turn up the central heating, serve Hawaiian pork, and dream a little?

The Diggles Kitchens, volume one and volume two — European recipes — cost £4.99 each or £9 the two from Micro Computer Software, Unit D6, Pear Industrial Estate, Stockport Road, Lower Bradbury, Stockport SK6 2BP.

Carnell adventure

IF YOU are bored with soaking-up the sun, or cannot become enthusiastic about a day trip to Clacton, how about widening your horizons with an **Adventure**? Carnell Software has produced three 16K cassettes, each with an adventure and another substantial game.

In **Volcanic Dungeon**, you enter the realm of myth and magic to rescue the Princess Edora from the three-fold clutches of the goddess of evil, the Snow Queen, and the Witch of the Black Mountains. You are given a map of the 80 connected caverns, filled with monsters, pits and fire. Armies of goblins and ice giants await. Weapons and magical objects are scattered around and you must watch your strength and water levels.

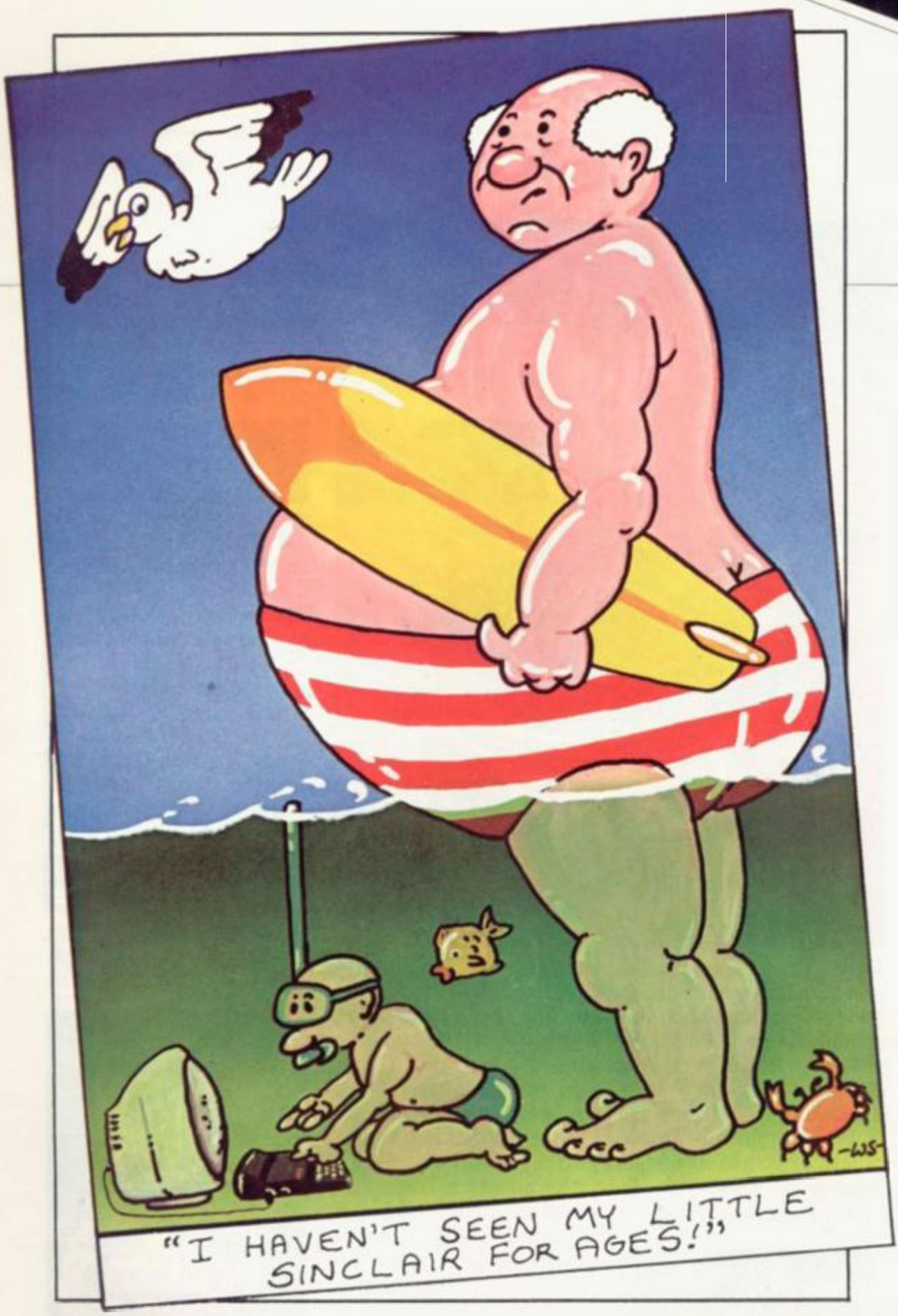
Also on the cassette is **Hangman** with a built-in 400-word vocabulary; the program allows for easy or difficult words, one or two players, and has full screen graphics.

In **Alien Intruder** you wake from cryogenic suspension to find that the rest of the starship crew has been eaten by an alien monster — and it will soon be dinner-time again. A graphics display shows any life forms on the same level — the ship has three levels — so you can watch the alien move closer.

Another display shows what exits are possible from the room or corridor you are in, and a third display shows what you have been able to load into your space shuttle craft, which is your only hope of escape. Food, water, oxygen, weapons and other

useful objects are scattered around.

On the other side of Alien Intruder is **Hieroglyphics**, a clever variation of Hangman, in which a 39-symbol ancient



alphabet has to be deciphered before the famous explorer, Wullie Makeit, is buried in sand. Both programs make good use of graphics and words to make a very entertaining package.

Wumpus Adventure features the most ancient and terrible creature of computer mythology. You must track the Wumpus by its smell and chilling cry through a maze of caves containing a host of terrors.

Goblins may catch you and tie you up as a morsel for their god, the Wumpus; bats may pick you up and drop you in another cave, which may contain a bottomless pit or a giant serpent — or only a swamp if you are lucky. Up to four players can take part and if you happen to step into Wumpus muck, one of the other players may smell you and fire an arrow at you, in mistake for the monster.

With Wumpus Adventure there is **Movie Mogul**, which gives a taste of the trials and tribulations of Hollywood. See a day's filming go down the drain when the leading actor punches the leading lady in the mouth; try to balance location and studio filming, while keeping in mind the current fashions among the movie buffs. Wumpus and Mogul are two good non-graphics programs to keep you off the beach for hours.

Volcanic Dungeon/Hangman costs £4.50 and the other two tapes are £5 each, plus 50 pence p&p, from R Carnell, 4 Stainton Road, Slough, Berkshire.

Asteroids in the home

INSTEAD of waiting for the amusement arcades to open, the Electronic Pencil Co **Asteroids** brings home the action. It has nearly all the features of the 20 pence guzzlers; one or two players, four sizes of asteroids, hunter-killer alien spaceship and on-screen scoring. There are five levels of play and the top five scorers have their names displayed.

Written in 100 percent machine code, Asteroids costs £3.95 from the Electronic Pencil Co.

Machine tools

MARTIN Wren-Hilton, the U.K. correspondent of the American *Sync* magazine, has taken time from his A level studies to produce two remarkable machine code programs for 16K ZX-81s. The first, **Super-Zap**, sounds like yet another space invaders game but is in fact a separate loading and saving routine, entirely distinct from the routines in the Sinclair ROM.

Many machine code programs now available start running automatically after loading and since they often use their own keyboard scanning routines, they do not respond to the Break key. Wren-Hilton wanted to be able to look at those

continued on page 16

continued from page 15

programs and see how they worked, so he developed Super-Zap, which loads the program byte by byte into a Basic array, so that it can be examined without running it. That array can then be saved on tape, either in its original format so that it auto-runs on loading, or in a super-zapped format, in which case it does not.

Wren-Hilton's second program is **Lower Case**, which allows mixed upper- and lower-case letters to be output to the printer. The program re-sets RAMTOP and stores its 1½K of machine code above it. A simple USR call operates the special Copy routine, which turns any inverse characters on the screen into lower-case on the printer. True descenders occur as required and the routine runs as quickly as the normal copy. The number of lines to be copied can be altered with a POKE and the routine has a typing program developed by a satisfied user.

Super-Zap and Lower Case cost £4.95 each from Martin Wren-Hilton, 4 Little Poulton Lane, Poulton-le-Fylde, Nr. Blackpool, Lancs FY6 7ET.

Silversoft arcade

THERE ARE two more programs from Silversoft in case you caught the arcade itch at the seaside. **Asteroids** has three sizes of asteroids, left and right turn, fire and thrust controls. There are 10 levels of play from soppy to suicidal, with bonuses for knocking-out the mother-ships. On-screen scoring and high score make this a good all-machine-code version of the game for £5.95.

Space Invaders is the closest yet to the arcade original. It has 10 levels of play, command ships, plenty of bombs to dodge, smooth machine code action, on-screen scoring and high score. Like the original, when you reach the last few invaders they start moving faster, so a steady hand and a good eye are required. If you manage one screen, the next group start one step further down.

As an extra bonus, the program includes the software necessary to run the Quicksilva character generator, for even more realistic invaders action. It costs £4.95 from Silversoft, 40 Empress Avenue, Ilford, Essex.

Playing for high stakes

IF YOU have decided on Littlehampton rather than Las Vegas for your holiday this year, you can still taste the high stakes action with two 16K programs from Newline Software. **Three Card Brag** lets you start with £100 which you put into the pot and your cards are dealt. Then it is for you to decide whether you fold, brag — raise the stakes — or pay to see the computer hand. The ZX-81 has the same options and the pot may soon become substantial. The rules are simple and the game addictive but if you decide that the computer is cheating, please do not shoot it, as that is extra ventilation it can do without.

The second program is the American dice game **Craps**, which also has simple rules and high stakes. One to four players or shooters can pit their nerve against the random fall of the dice, taking it in turn to try to make a natural while avoiding snake eyes, which is craps — and you thought

computer jargon was complicated?

The programs have excellent full-screen graphics and cost £5.50 and £3.95 respectively, from Newline, 8 Ewell Rd, Wollaton, Nottingham NG8 2DE.

ENHANCE YOUR SINCLAIR ZX81!

Video Inverter adds professional touch

Displays sharp, white characters on solid black background TV screen.

A toggle switch lets you choose between NORMAL and REVERSE.

NEW ORDER NOW!

KIT £4
READY BUILT £5
(VAT, P&P inc.)

A small printed circuit board fits on top of the logic chip inside your ZX81.

Comprehensive, easy to follow, step by step instructions make the modification a simple task.

We will fit your inverter to your ZX81 for **£7.50**.

For convenience print your name and address on back of your cheque or postal order and send to:

D. FRITSCH,
6 Stanton Road,
Thelwall,
Warrington
WA4 2HS

NOW FROM AFDEC

ZX81
RAMPACKS
16K
£25.00

Inclusive and post free.

Well proven design. Simplicity itself — Just plug in and go. Power derived from ZX81 without additional connections.

Ingenious flush mounting design eliminates 'Wobble' and accidental memory loss.

Special feature — LED On/Off indicator.

Coming soon — A professional keyboard at an affordable price.

Send the coupon TODAY for your Rampack. Allow 14-21 days for delivery.

AFDEC ELECTRONICS LTD, 318 Kempshott Lane Basingstoke, Hants.

Please supply . . . . 16K Rampacks at £25.00 inclusive.
Cheque/P.O./Money Order enclosed £. . . .

Please Print Clearly.

Name .....
Address .....
.....
.....

ZX Spectrum
20 Programs £6.95

The ZX Spectrum has brought advanced computing power into your home, The Cambridge Colour Collection, a book of 20 programs, is all you need to make it come alive.

No experience required. Simply enter the programs from the book or load them from tape (£2.95 extra) and run.

Amazing effects. All programs are fully animated using hi-res graphics, colour and sound wherever possible.

Entirely original. None of these programs has ever been published before.

Proven Quality. The author already has 30,000 satisfied purchasers of his book of ZX81 programs.

Hours of entertainment

- **Lunar Landing.** Control the angle of descent and jet thrust to steer the lunar module to a safe landing on the moon's surface.
- **Maze.** Find your way out from the centre of a random maze.
- **Android Nim.** Play the Spectrum at the ancient game of Nim using creatures from outer-space.
- **Biorhythms.** Plot the cycles of your Emotional, Intellectual and Physical activity. Some would say this is not a game at all.

Improve your mind

- **Morse.** A complete morse-code training kit. This program will take a complete beginner to R.A.E. proficiency.
- **Maths.** Adjustable to various levels, this program is an invaluable aid to anyone trying to improve their arithmetic.

Run your life more efficiently

- **Home Accounts.** Keeping track of your finances with this easy-to-use program will enable you to see at a glance where the money goes and plan your spending more effectively.
- **Telephone Address Pad.** Instant access to many pages of information.
- **Calendar.** Displays a 3 month calendar past or future, ideal for planning or tracing past events.

ORDER FORM:

Send Cheque or P.O. with order to:–
Dept. D., Richard Francis Altwasser, 22 Foxhollow, Bar Hill, Cambridge CB3 8EP

Please send me

☐ Copies Cambridge Colour Collection Book only £6.95 each.
☐ Copies Cambridge Colour Collection Book & Cassette £9.90 each

Name: _____

Address: _____

_____

ZX99 AUTOMATIC TAPE CONTROL

The logical extension for the Sinclair ZX81 giving data retrieval & word processing

£59·95 plus P & P

The ZX99 Tape Control system is a sophisticated extension to the Sinclair ZX81 Microcomputer, providing remarkable additional capabilities, which allow both the beginner and expert access to a professional computing system without the expected expense.

✸ DATA PROCESSING

The ZX99 gives you full software control of up to four tape decks (two for reading and two for writing) allowing merging of data files to update and modify them. This is achieved by using the remote sockets of the tape decks to control their motors as commanded by a program.

✸ PRINTER INTERFACE

The ZX99 has a RS232C interface allowing you direct connection with any such serial printer using the industry standard ASCII character code (you can now print on plain paper in upper and lower case and up to 132 characters per line.)

✸ MANY SPECIAL FEATURES

There are so many different features that it is difficult to list them all:
For example:

AUTOMATIC TAPE TO TAPE COPY: You can copy any data file regardless of your memory capacity (a C90 has approx 200K bytes on it) as it is loaded through the Sinclair block by block.

TAPE BLOCK SKIP without destroying the contents of memory.

DIAGNOSTIC INFORMATION to assist in achieving the best recording settings.

✸ TAPE DRIVES

We supply (and guarantee its compatability) a Tape Drive that works with your computer.

✸ COMPUTER CASSETTES

We supply quality (screw assembled) computer cassettes. Please enquire for any not shown:

The ZX99 contains its own 2K ROM which acts as an extension to the firmware already resident in your ZX81'S own ROM. The ZX99's ROM contains the tape operating system, whose functions are accessed via Basic USR function calls. Each function has an entry address which must be quoted after the USR keyword. All of the functions can be used in program statements, or in immediate commands (i.e. both statements with line numbers and commands without them).

There is an extension board on the rear to plug in your RAM pack (larger than 16K if required). The unit is supplied with one special cassette lead, more are available at £1 each (see below).

COMPREHENSIVE USER MANUAL INCLUDED IN PRICE

✸ ZX99 SOFTWARE ✸

We now have available "Editor-99", a quality word processing program including mail-merge, supplied on cassette for £9.95. Also, following soon will be:

* Stock Control
* Sales Ledger
* Business Accounts
* Order Processing
* Debtors Ledger
* Tax Accounting

COMPUTER CASSETTES	QTY	PRICE	TOTAL
C5		35p	
C10		37p	
C12		38p	
C15		39p	
C20		41p	
C25		43p	
C30		44p	
Add min £1·50 or 10% P & P			

ITEM	QTY	PRICE	P&P	TOTAL
CASSETTES	See left			
ZX99		59·95	2·95	
E312 Tape Drive		24·00	1·00	
EDITOR-99		9·95	·50	
CASSETTE LEAD		1·00	·20	

Cheque/PO payable to Storkrose Ltd.
or
Charge my Access/Visa card no:

SIGNED _____

ORDER FORM TO:
data-assette
Dept SU4
44 Shroton Street
London NW1 6UG Tel: 01-258 0409
Telephone enquiries welcome

NAME _____

ADDRESS _____

Colour for Scisoft maths

ANNUAL subscriptions for *Sinclair User* and *Sinclair Programs* are among prizes being offered in a competition for the under-11s. The winner will be the child who does the best colouring of the cover of the **Jungle Maths** cassette which is produced by Scisoft, the educational software house.

The competition is being run jointly by Scisoft and Microware, the Leicester software and hardware retailer. As well as the subscriptions, the winner will receive a Microware voucher.

Entry forms will be given with a copy of the cassette. Entries close on September 30 and the winner should be announced in the December issue of *Sinclair User*.

Mike Johnston

Northern fair 'a disaster'

THE FIRST computer fair for hobbyists to be held outside London was a "disaster". That was the verdict of the majority of exhibitors at the ZX Microfair in Manchester.

A variety of reasons were advanced, including the visit of the Pope to Manchester the following day; 'the bright warm Bank Holiday weather'; it was held at the wrong time with the Spectrum hanging over the market; and it was staged at the wrong venue with the New Central Hall being on the wrong side of the city, where parking was a problem. The result was that 2,000 people visited the show and spent little money there.

"I think it reflected the state of the market and there were a few things which went against it," said the organiser, Mike Johnston. "We had about 2,000 people compared to between 5,000 and 6,000 at the London shows but we are not talking about the same catchment area and if we had held it only on one day, the attendance would have been reasonable.".

A major criticism from exhibitors was that the show had not been given sufficient publicity. Sue James of Microware in Leicester said that in her company's advertisement in *Sinclair User* in June the Manchester Microfair was mentioned and the company had received many calls from people who had not known about it.

Johnston replied: "It received the same amount of coverage as the previous London shows, when we were criticised for having too many people."

He added that he had not been deterred from organising fairs and would be holding another.

The experience of Manchester does not appear to have influenced companies unduly from exhibiting at shows outside London. The next two provincial shows were both reporting a high level of interest.

Gordon Hewit, a committee member of the Edinburgh ZX Computer Club, which held a fair in July said that many exhibitors disappointed with the Manchester show had turned to them in the hope of doing better.

"They see Scotland as a more fertile area and, with Edinburgh being a good centre of communications, we can attract people from all over the centre of Scotland," he said.

On the same weekend Microfest 82 was held in Manchester.One of the organisers, Dave Hewitt, said that many of the people had wanted to take space because it seemed to be better organised.

ZX-81 taking off in the States

THE ZX-81 is beginning to take off in the States. An agreement between Sinclair Research and the American Express credit card company has resulted in a flood of orders for the machine.

The credit card company sent a direct mail offer to its two million cardholders in the U.S. at the end of May. In what Sinclair Research calls "a very positive response", 2,000 orders were received by noon the day following the offer. In the first three weeks more than 25,000 orders were sent to American Express.

Total sales from the offer have been forecast at 50,000 units and it is thought that may be a conservative estimate.

The offer was agreed between American Express and Sinclair Research following a succesful test marketing for the ZX-81 at the end of last year. The test market had been requested by the credit card company.

The deal does not affect the plans by Timex to market its enhanced version of the ZX-81, the Timex Sinclair 1000, which has a 2K RAM instead of the normal 1K. That will not be on sale until this month and Sinclair Research in the U.S. is continuing to sell the ZX-81 until the Timex sales reach a certain level.

Sales of the ZX-81 were 15,000 a month in the U.S. in the early part of the year and it is estimated that 435,000 have been sold throughout the world.

Sales in Britain declined in April but are said to have recovered in May. The machine is being promoted in new markets. Sales are going well in France and reasonably well in Germany and increasing in other markets.

Spectrums six weeks late

ALMOST two months after the launch in a blaze of publicity at the Earls Court Computer Fair in April, Spectrums at last were being delivered in June. The delivery dates being quoted at the launch were a confident two weeks for the first orders. According to Sinclair Research, the initial delay was caused by the time needed to have production running smoothly.

When the first batch of 16K machines was ready eventually for despatch at about the beginning of June, a design fault was discovered. No-one is saying what the fault was but Bill Nichols, Sinclair Research public relations officer, said: "It was a very obscure fault which would not have shown up 80 or 90 percent of the time."

Once that had been dealt with, there was a distribution dispute at Timex. Nicholls added that delays of between six and eight weeks were likely for people who had ordered by the first week in June. After that, delivery should be down to the standard 28 days.

Lending software

A NEW software library has been set up to allow Sinclair users to take advantage of the many items on the market without having to buy the cassettes.

Membership of the Sinclair Owners' Software Library costs £5, which includes the hire of the first cassette. Subsequent tapes can be hired at £1 for three weeks.

A quarterly newsletter is also sent to all members, with details of new additions to the range. The subjects covered include games, educational and toolkit programs.

Sale may raise £10m

SINCLAIR Research has passed the first hurdle in the planned sale of shares in the company. It has passed the preliminary audit commissioned by the merchant bankers, N M Rothschild, and the sale is expected in the autumn.

Rothschild is arranging the final details, which are likely to involve selling to chosen City institutions 10 percent of the company. It is expected to raise at least £10 million, which would put a valuation of £100 million on Sinclair Research but the figure raised could be £20 million.

PSS

PERSONAL SOFTWARE SERVICES, 112 OLIVER STREET, COVENTRY CV6 5FE.

ZX-81 OWNERS — YOU CAN NOW

LOAD/SAVE 16K IN 26 SECS

WITH THE INCREDIBLE QSAVE PACKAGE FROM PSS

*Verify successful saving of programs *Compatible with your existing recorder
*No hardware modifications needed *No extra power supply necessary
*No more wasted time waiting for programs to load or save

QSAVE comes in two parts: A HARDWARE — simply plug the QSAVE amplifier/filter between your existing tape reader and the ZX81 (all leads supplied).

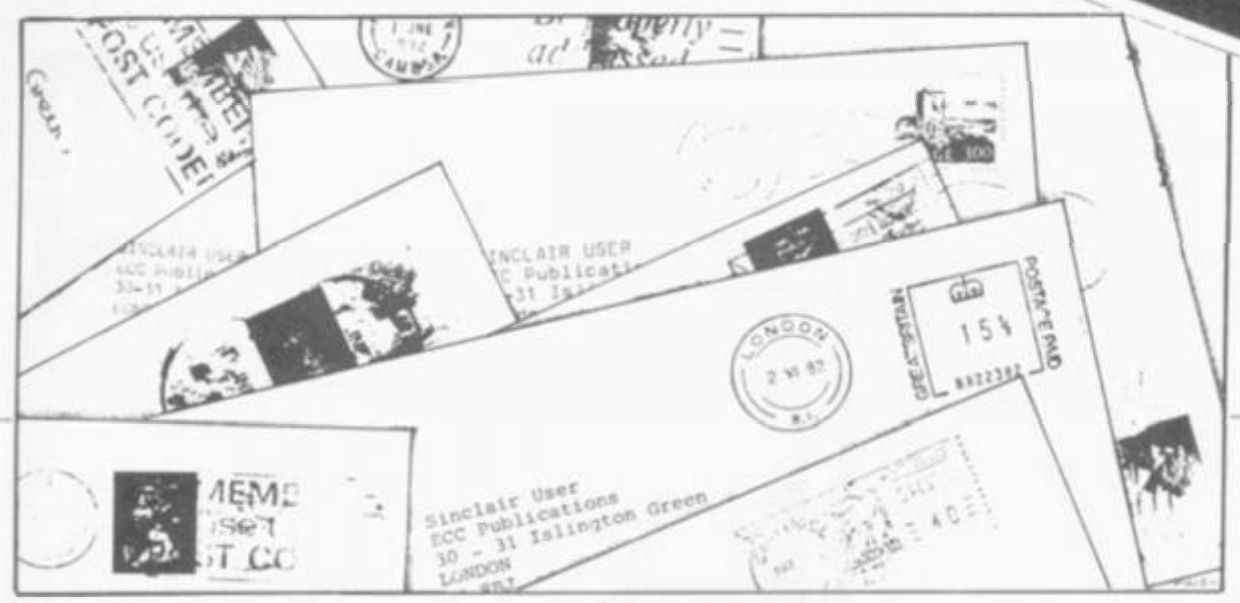
B SOFTWARE - Load the QSAVE cassette before you load a tape or key in a program. You can then save & reload a full 16K (including RAMTOP) in only 26 seconds. i.e. a data transfer rate of 4000+ BAUD compared with only 250 on the standard ZX81.
QSAVE also gives your ZX81 a verify function just like the Spectrum which allows you to check that your programs have saved properly.

REVOLUTIONISE YOUR PROGRAMMING NOW FOR THE ALL INCLUSIVE PRICE OF £14.90

Make cheques, P/O's payable to PSS. Full money back guarantee. Normal delivery within 7-14 days.

ZX SOFTWARE FROM PSS

We also have the widest range of high quality software for the ZX81 available anywhere. Whatever your needs we have the program for you. From a superb version of PUCKMAN to a Compiler or a complete wordprocessor package — you need look no further than PSS. In addition — all of our software is available through the ZX Software Library. For a once only payment of £5.50 you can have any five of our packages (£10.00 for ten). You take one tape at a time and make your own copies — save yourself £'s on list prices. SAE for full details.



Contest too difficult

I AM writing to complain about the competition in your June issue. What annoys me most is that the amount of people entering this competition is limited to those who have a fair amount of knowledge about electronics and computers, and that must surely be a small percentage of your readers.

As this is a magazine for all Sinclair users, surely a competition which everyone could enter would be more appropriate?

Admittedly, the Spectrum is an outstanding prize but if it is so good, why not give everyone a chance of winning one?

Despite the complaint, I think your magazine is excellent, so continue the good work.

Philip Morris,
Langford, Nr Bristol

• *There are two reasons why we decided to base the June competition on a hardware application. The previous two had been for software and we thought it better to set something for those with an interest in hardware. Second, we do not share your view that people with a knowledge of the electronics of computers comprise only a small percentage of our readership.*

Character error

HAVE YOU noticed that CHR$ 7 and 135 are printed as the same character in the ZX-81 manual and that the graphics character on KEY 3 is missing?

I have found out that the missing character has the code 135 and that the one printed is wrong. The character with code 135 is =.

Mark Colson,
Horncastle, Lincs.

Misprint problems

SEVERAL MONTHS ago I finally bought a ZX-81 and promptly set about mastering the manual. All went well until I reached page 129, Exercise 4, prophetically entitled "This one will drive you mad". Try as I might, every time I entered the program and tried to run it, I would be greeted with error code 5/90 or 5/150, or 5/210 if I pressed "Q".

After some thought, it occurred to me that the lines of the program the machine was trying to execute when the report codes appeared were all PRINT statements. That meant the machine was trying to execute those commands but had insufficient screen space to do so.

The next thing which occurred to me was that a SCROLL instruction had gone wrong somewhere, so I then set about jamming-in extra scroll statements where I could. Finally, I found that 42 SCROLL made the program work.

When I wrote to Sinclair to point this out, the answer arrived with commendable speed to the effect that there was a printing error in the program and that line 40 should be terminated with a comma. In fact, that makes the program run much prettier than my alteration.

The point is that I have never seen in your or any other publication any reference to the error and that is curious — because 250,000 people have not noticed it, or 250,000 people have ignored it, or 250,000 people have achieved such a level of programming ability by page 129 that they thought it beneath them to draw attention to it.

The reason I am writing is to pose the question if there are other misprints of which we are unaware? At the very least, I think that it would be very user-friendly of Sinclair to mail a list of errata to all purchasers, so freeing people like myself of a good deal of head-scratching.

Finally, a good test of pocket calculator accuracy over a series of functions is to find the Sin of 45 degrees, then find the Cos,Tan, ArcTan, ArcCos and ArcSin of each successive result, hoping that it will yield the answer 45 degrees again. In my experience, Casio calculators, for example, yield an error of half a percent while Sinclair calculators yield an error of 33 percent. Try it on the ZX-81, using a program of the kind 10 INPUT A, 20 PRINT A, SIN A, 30 LET B = SIN A, 40 PRINT B, COS B and so on. Note that 45 degrees must be converted to Pi/4, as the ZX-81 works in radians, and 45 cannot be handled. Try a few values and you will be amazed and aghast alternately at the results.

M P Campbell,
St Ives, Cambs.

RAM pack price falls

I AM writing about *Sinclair User* June, 1982. On page 5 you state that the Sinclair RAM pack has been reduced to £30. On page 10 you say the cheapest RAM pack is that of AVC Software at £32.50.

On pages 20, 42, 54 and 60, you advertise RAM packs for less than £30.

David Clifton,
Beckingham,
Doncaster, S. Yorkshire

Searle corrects

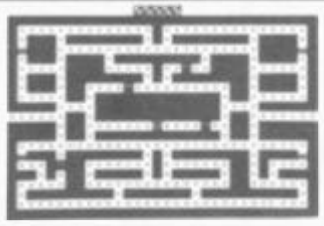
THE JUNE issue of *Sinclair User* contained an article about me by Elspeth Joiner. The article was based largely on an interview conducted on April 7, 1982, prior to the launch of the Spectrum personal computer. In the article I am quoted as saying that Sinclair Research Ltd will launch another small computer this year. I was, in fact, referring to the then imminent ZX Spectrum.

Sinclair Research Ltd has no plans to announce new personal computers in 1982.

Nigel Searle,
Head of Computer Division,
Sinclair Research Ltd,
Cambridge

SF GOBBLERS

PUCKMAN FOR 16K ZX81



BEAT THAT HIGH SCORE! GOBBLE THOSE DOTS BEFORE THOSE MEANIES GOBBLE YOU! YOUR ONLY AIDES ARE FOUR "POWER PILLS" WHICH MAKE THE MEANIES EDIBLE. BUT NOT FOR LONG!

- MACHINE CODED FOR FAST ACTION
- EXTRA "GOBBLER" FOR 10,000 POINTS
- ON SCREEN SCORING
- HIGH SCORE WITH "ENTER NAME" FACILITY
- UP TO 4 PLAYERS

AN ANNOYINGLY FRUSTRATING GAME FOR ONLY £5.95

SF ASTEROIDS FOR 16K ZX81

STAY ALIVE AS LONG AS POSSIBLE IN OPEN SPACE FILLED WITH FLYING ROCKS. SCORE BY SHOOTING THEM – WHICH ALSO CAUSES THEM TO BREAK INTO LOTS OF LITTLE BITS AND MAKES LIFE EVEN WORSE!

- MACHINE CODED FOR FAST ACTION
- ON SCREEN SCORING
- HIGH SCORE WITH 'ENTER NAME' FACILITY
- UP TO 4 PLAYERS
- EXTRA SHIP FOR 1,000 PTS (NOT AS EASY AS IT SOUNDS!)
- SHIP MOVES JUST LIKE ARCADE VERSION
- ROTATE LEFT/ROTATE RIGHT/THRUST
- FIRES IN ALL 8 DIRECTIONS
- INCREASING NUMBER OF ASTEROIDS
- THREE ASTEROID SIZES
- 'NASTY' ALIEN SPACE-SHIP (FIRES BACK!)

THIS GAME IS JUST AS BAD – AND ONLY £5.95

AN OFFER FOR REAL MASOCHISTS – BOTH TAPES FOR £9.95

MAIL ORDER ONLY-PLEASE MAKE CHEQUE/PO PAYABLE TO

THE SOFTWARE FARM

SF CRAIGO FARM, BOTANY BAY, TINTERN, GWENT SF

ZEDXTRA

COMPUTER ACCESSORIES

BOURNEMOUTH'S NEW SOFTWARE OUTLET FOR SINCLAIR COMPUTERS

GAMES – BANK ACCOUNT – EDUCATION – MULTIFILE
ADVENTURES – KEYBOARDS – GRAPHICS R.O.M.S. –
RAMPACKS – CASSETTE RECORDERS – BLANK TAPES

ZX81 — XTREK II — £4.95

THE ULTIMATE SPACE GAME FOR 16K FULL SCREEN GRAPHIC DISPLAY
Control your starship across the galaxy destroying the enemy with your photon torpedoes and phasers but beware the enemy retaliate!! Can you outwit them.
At the touch of Akey Scan the galaxy at long and short range to plan your strategic moves. The screen is filled with the quadrant you are in and give full status of your energy: force shield: quadrant condition time in star dates: photon torpedoes: quadrant: sector.
A very fast game!! Full documentation which includes sample game.

ZX SPECTRUM CHARACTER PROGRAMMER £5.50

Programme your user definable characters on screen with the character programmer. You can define characters using a X64 Matrix with full cursor controls.
This tool is a must for all programmers. Allows you to define your characters with no problems!! See your characters take shape as you define them! Facilities include: Editing existing character, clear character, define new character, define character using binary codes, define character using decimal codes, save character set to tape. Supplied with over 50 sample characters.
ALSO STOCKISTS OF LEADING BRANDS.

Please send me . . . . XTREK II at £4.95 each.
. . . . ZX CP at £5.50 each.

I enclose cheque for £ . . . . .

Cheques/postal orders should be made payable to ZEDXTRA and crossed // account payee.
ALL ORDERS WILL BE DESPATCHED BY RETURN.
For further information contact:

ZED X TRA *5 SCHOOL LANE, KINSON, BOURNEMOUTH. TEL: NORTHBOURNE (02016) 2498*

ZX81 users

I need more memory! please rush me the fully assembled, tested and guaranteed

'BYG BYTE'

16K RAM PACK

Name .....

Address .....

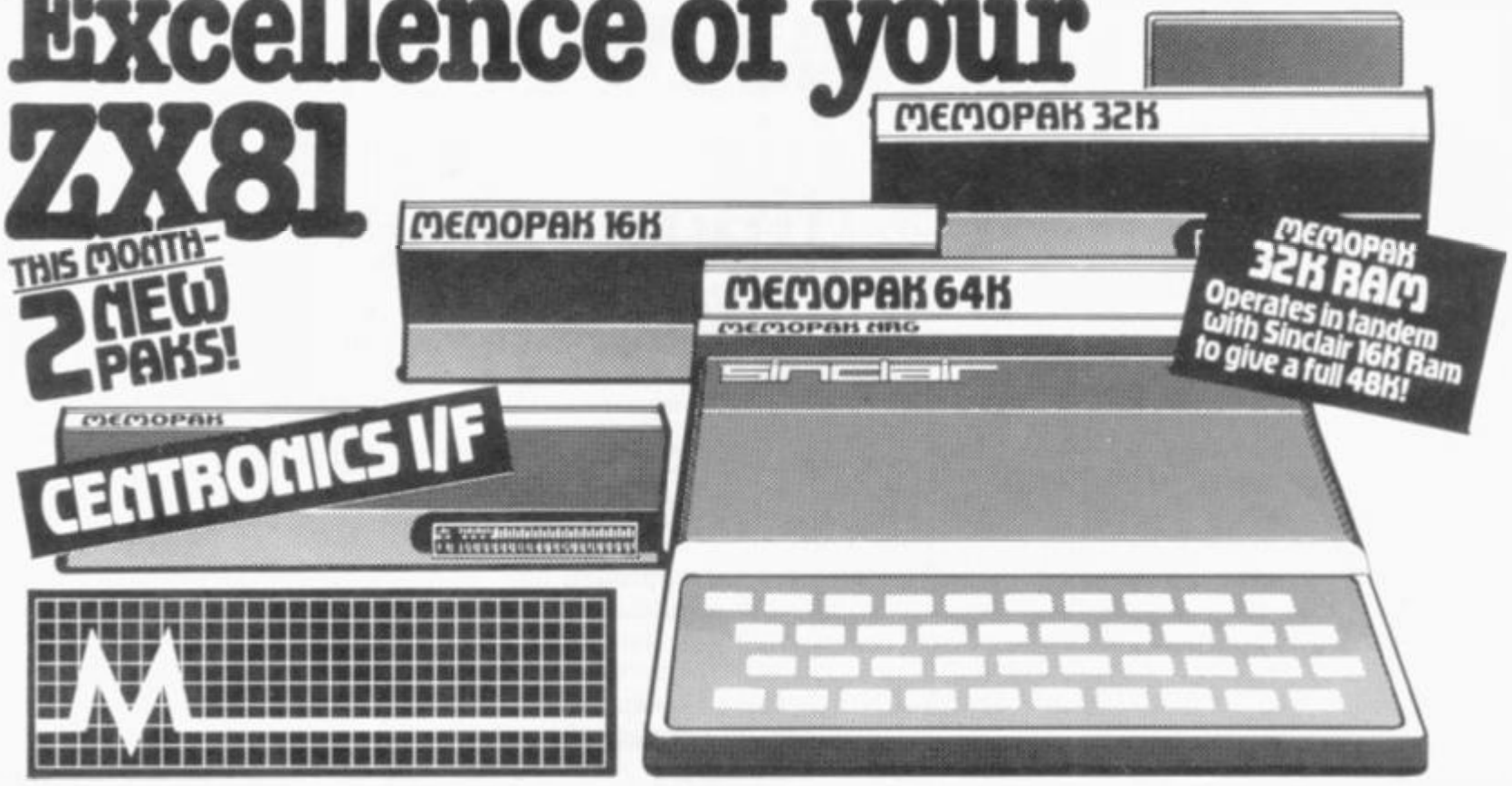
Make all cheques & PO's payable to:-
Phoenix Marketing, Oaklands House Solartron Road,
Farnborough, Hants. Tel: (0252) 514990

FULLY INCLUSIVE PRICE

DEPT. SU

£25.00

MEMOTECH Explores the Excellence of your ZX81



Memotech's Memopak Range

All five of the currently available Memopaks are housed in elegant black anodised aluminium cases, and are styled to fit wobble-free onto the back of the ZX81, allowing more add-ons (from Memotech or Sinclair) to be connected.

£68.70 plus VAT

MEMOPAK 64K MEMORY EXTENSION

The 64K Memopak extends the memory of the ZX81 by 56K, and with the ZX81 gives 64K, which is neither switched nor paged and is directly addressable. The unit is user transparent and accepts commands such as 10 DIM A(9000).
Breakdown of memory areas...0-8K-Sinclair ROM. 8-16K-This area can be used to hold machine code for communication between programmes or peripherals. 16-64K-A straight 48K for normal Basic use.

£43.43 (32K) / £26.00 (16K) plus VAT

MEMOPAK 32K and 16K MEMORY EXTENSIONS

These two packs extend and complete the Memotech RAM range (for the time being!) A notable feature of the 32K pack is that it will run in tandem with the Sinclair 16K memory extension to give 48K RAM total.

£52.00 plus VAT

MEMOPAK HIGH RES GRAPHICS PACK

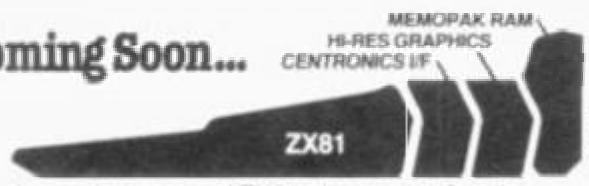
HRG Main Features — • Fully programmable Hi-Res (192 × 248 pixels) • Video page is both memory and bit mapped and can be located anywhere in RAM. • Number of Video pages is limited only by RAM size (each takes about 6.5K RAM) • Instant inverse video on/off gives flashing characters • Video pages can be superimposed • Video page access is similar to Basic plot/unplot commands • Contains 2K EPROM monitor with full range of graphics subroutines controlled by machine code or USR function

£34.70 plus VAT

MEMOPAK CENTRONICS TYPE PARALLEL PRINTER INTERFACE

Main Features — • Interfaces ZX81 and parallel printers of the Centronics type • Enables use of a range of dot matrix and daisy wheel printers with ZX81 • Compatible with ZX81 Basic, prints from LLIST, LPRINT and COPY • Contains firmware to convert ZX81 characters to ASCII code • Gives lower-case characters from ZX81 inverse character set

Coming Soon...



A complete range of ZX81 plug-in peripherals

Digitising Tablet **RS232 Interface**

We regret we are as yet unable to accept orders or enquiries concerning the above products, but we'll let you know as soon as they become available.

Access/Barclaycard Holders please Tel. Oxford (0865) 722102 (24 Hrs)

© R. Branton & G.A.C. Boyd 1982

Please make cheques payable to MEMOTECH Ltd.

Please Debit my Access/Barclaycard* account number

*Please delete whichever does not apply

Please send me	Price	No	Total
64K RAM £68.70 + £10.30 VAT	£79.00		
32K RAM £43.43 + £6.52 VAT	£49.95		
16K RAM £26.00 + £3.90 VAT	£29.90		
HRG £52.00 + £7.80 VAT	£59.80		
CENTRONICS I/F £34.70 + £5.20 VAT	£39.90		
Packaging & Postage £2.00 per unit			
		TOTAL ENC	

SIGNATURE _____ DATE _____

NAME _____ ADDRESS _____

_____ TELEPHONE _____

We want to be sure you are satisfied with your Memopak – so we offer a 14-day money back Guarantee on all our products.

Memotech Limited, 3 Collins Street, Oxford OX4 1XL, England Tel: Oxford (0865) 722102 Telex: 837220 Orchid G

Getting a quart into a pint pot

D.J. Todorovic considers data code compression by changing character codes

THE IDEA of data code compression is certainly not new, as it has been used in various forms for a long time in mainframe computers. The process of increasing the number of valid and unambiguous data characters which can be stored in a given memory area can be achieved either by reducing the number of bits used to describe each data character — i.e., by changing the character codes or by reducing the number of redundant and insignificant data characters such as space characters.

The routines described are one example of a former approach on the ZX-81 but with practical value on machines with more than 1K of RAM.

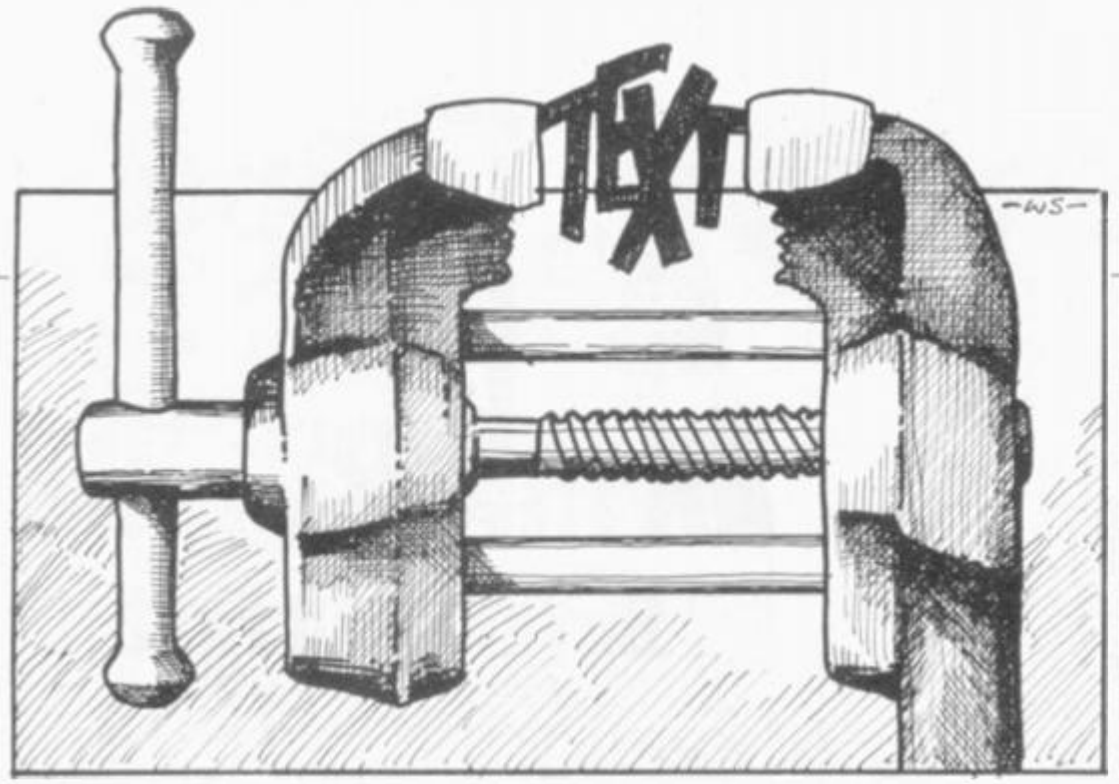
As it is true for all compression methods, there must be a kind of trade-off. In this case, besides the increased processing requirements due to the existence of compactor routines, there is also a serious restriction on usable character set; usable set is limited to 39 characters, including letters A-Z, digits Ø-9, two special characters — comma and period — and a space. All other characters, including special, graphic and inverse characters, are illegal and are flagged as such if submitted to the compression routine.

On the other hand, compactor routines are providing the compression ratio of 2:3, so the compressed text will occupy only two-thirds of the area required by the original text. Bearing in mind character-set limitations, the routines either may reduce the required memory area or provide a 50 percent increase of usable text length.

As the space savings should be greater than the space occupied by compactor routines — 314 bytes for compress and 282 bytes for expand — the approach is beneficial only on larger amounts of text data — more than 2,000 characters — as such programs compactor routines might improve significantly the space utilisation and increase the amount of text stored.

The test program shown in figure one, up to line 140, is only to demonstrate compactor routines and to print the results after each step. It will solicit the input string text and the operation may be terminated by inputting "BYE". It also contains a small error routine, which is used only if the input text contains an invalid character — i.e., return from compress routine with

```
   10 REM **ZX81 TEXT COMPACTER**
   20 REM C GTN 1982
   25 LET K=1
   30 INPUT T$
   40 IF T$="BYE" THEN STOP
   50 PRINT "TEXT: ";T$
   60 GOSUB 8000
   70 IF K>0 THEN GOTO 110
   80 PRINT "ERROR ";T$
   90 PRINT TAB (6+B+C);"GRAPHIC
?"
  100 GOTO 30
  110 GOSUB 8205
  120 PRINT LEN C$;" CH. COMPRESS
ED: ";C$
  130 PRINT LEN T$;" CH. EXPANDED
: ";T$
  140 GOTO 30
 8000 REM **COMPRESS ROUTINE**
 8005 FAST
 8010 LET C$=""
 8020 LET T$=T$+"(DOUBLE SPACE)"
 8030 FOR C=1 TO LEN T$-2 STEP 3
 8040 LET X=0
 8050 FOR B=0 TO 2
 8060 LET K=CODE T$(B+C)
 8070 LET K=1+K*(K>25 AND K<64)-2
5*(K<>0)
 8080 IF K<=0 THEN RETURN
 8090 LET X=X+K*40**B
 8100 NEXT B
 8110 LET C$=C$+CHR$ (X/256+.5)+C
HR$ (X-256*INT (X/256))
 8120 NEXT C
 8125 SLOW
 8130 RETURN
 8200 REM **EXPAND ROUTINE**
 8205 FAST
 8210 LET T$=""
 8220 FOR C=1 TO LEN C$ STEP 2
 8230 LET X=256*CODE C$(C)+CODE C
$(C+1)
 8240 LET X3=INT (X/1600)
 8250 LET X=X-X3*1600
 8260 LET X2=INT (X/40)
 8270 LET X1=X-X2*40
 8280 LET T$=T$+CHR$ (X1+24 AND X
1-1)+CHR$ (X2+24 AND X2-1)+CHR$
(X3+24 AND X3-1)
 8290 NEXT C
 8295 SLOW
 8300 RETURN
```



variable K not greater than 0. In that case input text is printed with the invalid character flagged underneath with an inverse "?".

Routines for text compression at line 8000 and expansion at line 8200 are both designed to operate in FAST mode and revert to SLOW just before returning to the main program. By omitting lines 8005, 8125, 8205 and 8295, the operational mode of these routines will be as set in the main program. Compactor routines use the following variables:

T$ — string which contains the original text, as an input for the compress routine, or the expanded text, as an output from the expand routine.

C$ — string which contains the compressed text as an output from the compress routine or an input for the expand routine. Note that PRINT of this string may be unreadable and look longer than the original text, depending on the bit pattern obtained in the compression, which may produce any of the ZX-81 character codes.

C — current token position within the original text.

B — current position within a text token — three characters from the original text.

K current valid character code. There are 39 valid characters mapped starting from 1 for space and values 2 to 39 are assigned for ZX-81 characters from comma to Z. Values equal to or less than zero are returned to the main program if the compress routine encounters an invalid character on position B + C from the start of the original text. Note that this variable must be preset to 1 in the main program — line 25 — before calling the compress routine to cope with empty input text.

X, X1, X3, X3 — used in the transformation process to calculate character codes.

The 0.5 offset which is used in line 8110 is to provide the correct rounding-up for the CHR$ function. Also note in line 8280 the use of logic AND, which would provide expansion with 1 mapped as a space character. Use of the logic function is also obvious in line 8070, where different non-contiguous values are assigned to variable K.

When the character set is not entirely satisfactory there is a possible modification, shown in figure two. This is the solution used normally on ASCII-coded machines — remember that ZX-81 is not — and involves the use of a conversion string SS. That is a user-definable string which also contains 39 characters — as the previous restriction still holds — but it is possible to put in any combination of characters, which therefore are declared as a valid set for compactor routines.

To optimise the transformation process, more-often-used characters should be placed at the beginning of the string SS. String S$ as defined on line 26 of figure two is using the same valid set as the routines from figure one. There are also some changes in the compress and expand routine but the solution from figure two would require the definition of the string S$ in both programs, if the compress and expand routines are used in separate programs.

The idea of text compacting as shown in figure two might be enhanced and the valid character set enlarged by making S$ the string array. Of course, as we need some additional indexing within that string array which will enable switching from one string array element to the other, it will be at the expense of the compression ratio, which will be less effective.

The routines can be used to compress text data which is to be stored together with a program on the cassette and are therefore very usable in programs handling directories and indices. It is also possible to handle in a similar way the read-only text as, after entering it, compressing and storing in arrays, such programs do not need the compress routine. So before such a program is saved on the cassette, the compress routine may be deleted, as in normal use the program will need only the expand routine to prepare the data to be PRINTed.

Besides further savings in memory space, this method provides additional security benefits, since the LOADed program will contain text data which cannot be modified easily without the compress routine.

```
  26 LET S$=" (SPACE) "+"0123456789
ABCDEFGHIJKLMNOPQRSTUVWXYZ.,"
  70 IF K<40 THEN GOTO 110
8060 FOR K=1 TO 39
8070 IF T$(B+C)=S$(K) THEN GOTO
8090
8080 NEXT K
8085 RETURN
8280 LET T$=T$+S$(X1)+S$(X2)+S$(
X3)
```

THE

BUFFER

MICRO SHOP

(NEXT TO STREATHAM STATION)

★ ★ ★

NEW SOFTWARE SHOP EXCLUSIVELY FOR

ZX81

PROGRAMS, GAMES, "ADD/ONS"

★ ★ ★

MOST OF THE MAIL ORDER ITEMS ADVERTISED IN THIS MAGAZINE AVAILABLE OVER THE COUNTER

★ ★ ★

LOADING PROBLEMS? TRY OUR INTERFACE
BUSINESS & TECHNICAL DATA HANDLING PROGS.
PROPER KEYBOARDS; CONSOLES; VDUS

★ ★ ★

**374A STREATHAM HIGH ROAD,
LONDON SW16
Tel: 01- 769 2887**

S.A.E. APPRECIATED FOR CATALOGUE

THE EXPLORER'S GUIDE To The ZX81

The Book for the ZX81 Enthusiast.

By Mike Lord, 120 pages.

Programs for 1K RAM, and programs for 16K RAM. Games, Business and Engineering Applications. RAM & I/O Circuits. Useful ROM Routines. Hints and Tips.

£4.95

What Can I Do with 1K?

By Roger Valentine. A fresh and original book containing 40 programs and routines for the unexpanded ZX81.

£4.95

The ZX80 Magic Book

With 8K ROM/ZX81 Supplement

£4.75

Mastering Machine Code on your ZX81

By Toni Baker. 180 pages of immense value to beginner and expert alike.

£7.50

We welcome Access VISA

ALL PRICES INCLUDE U.K. P & P AND 15% VAT WHERE APPLICABLE. OVERSEAS CUSTOMERS ADD £1.50 CARRIAGE PER ORDER.

TIMEDATA LTD Dept H 57 Swallowdale, Basildon, Essex SS16 5JG Tel: (0268) 411125 (MON-FRI)

TIMEDATA

4th. ZX MICROFAIR

Buying your first computer?

Looking for SPECTRUM software?

Want to expand your ZX81?

Need technical advice?

Whatever the problem you'll find the answer at the ZX Microfair – the user friendly show exclusively for ZX Computers.

With the growing range of ZX products now available you'll want to choose the best. Now you can see for yourself and try them all out.

Chat with the experts before you buy (there's a whole section for local user groups) or just browse through the new books and magazines.

You can see demonstrations, displays and many new products. You can even sell your micro or pick up a bargain at the bring-and-buy sale.

The Westminster Exhibition Centre is large enough to see it all in comfort – without queuing!

Whatever your interest – hobby/home, business or educational, there's lots to see at the Microfair.

So come along to the ZX event of the year and make the most of your Sinclair Computer!

Admission: Adult 60p, Child (under 14) 40p
Advance tickets from:
Mike Johnston, 71 Park Lane,
London N17 0HG (Enclose S.A.E.).

4th ZX MICROFAIR

**One day: 10am to 6pm.
August 21st. Westminster Exhibition Centre
(Royal Horticultural Society New Hall)
Greycoat Street, London SW1.
Nearest Tube, Victoria or St James' Park.**

Come to the ZX-81 with a clear mind to make the best use of your new machine.

Lifetime's obsession can easily be acquired

BUYING a ZX-81 can be the start of a lifetime obsession with home computing. It is easy, however, to become discouraged if everything does not go to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the ZX-81 is to abandon any ideas for special uses. While the basic machine is ideal for learning how to use computers, it is too small for any major uses. It is better to become accustomed to the many facilities and then decide how you wish to ue them.

Begin by unpacking the machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for a second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

Once the K appears you are ready to begin learning about the ZX-81. It can save family arguments if you can afford a separate television set for your system. It also makes life easier if you can find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

The manual is written in great detail and is reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something which is important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are really ready but that is likely to lead to errors. For example, words like AND, THEN, and AT should not be typed-in letter by letter. By the time you have reached chapter 11, you should have accumulated sufficient knowledge to be able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important that when using the machine it is not jolted. Some of the connections can easily work loose and everything which has been put in will be lost.

The manual is not to everyone's taste and if you find it difficult to follow, a number of books on the market can help you. Find the one which suits you best.

As a way of relaxing, you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy. There are some programs for the unexpanded 1K machine but most of them require a 16K RAM pack. The tapes vary in quality. It is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about the ZX-81 is to plunge in at the deep end and see what the computer will do. Refer to the manual when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machine.

You may have heard already about the problem involved in SAVEing and LOADing your own cassettes. The manual again gives detailed instructions but many of the early machines would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

They usually occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD" " followed by NEWLINE; then slowly increase the volume of the recorder with the tape running until the television screen shows four or five thick horizontal black bands. If you then re-wind the tape, the program should LOAD normally.

Finally, a health warning. Apart from any practical uses, computing with your ZX-81 can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning, thinking that in another five minutes you will sort out the problem.

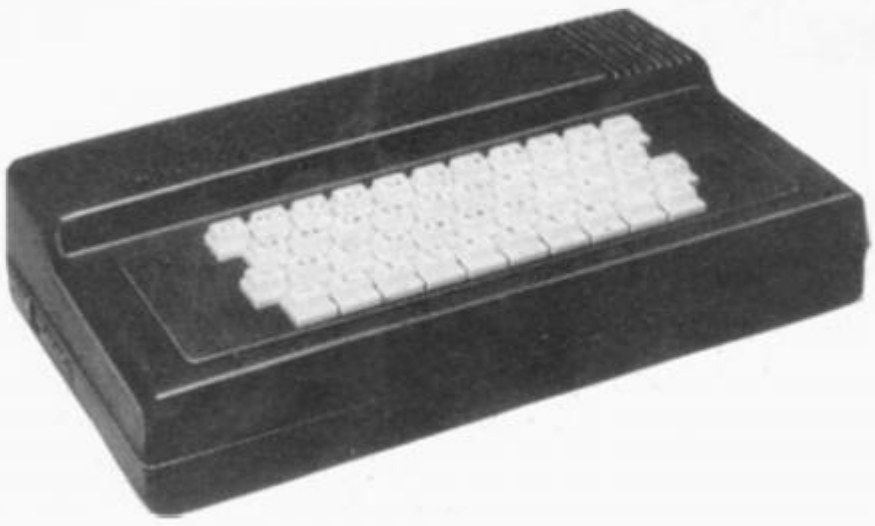
Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a ZX-81 you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours with your Sinclair machine.

FULLER FD SYSTEM £39.95

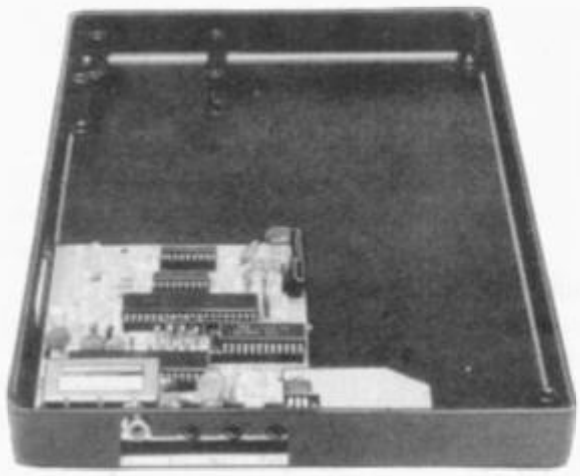
Professional Keyboard & Case for Sinclair ZX81 & ZX Spectrum

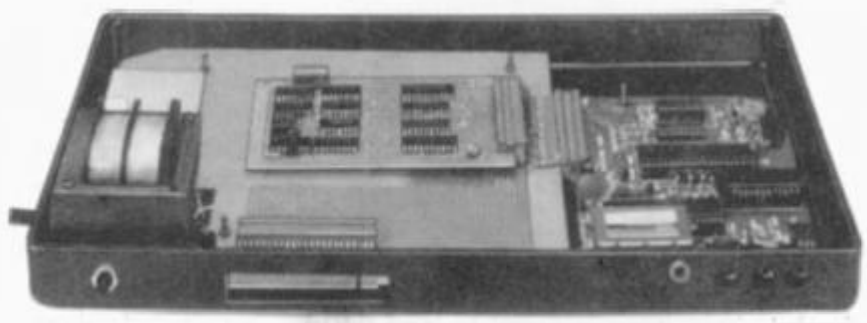


The ZX81 fits inside
The tough ABS injection moulded plastic case measures 8" x 14" x 2½" and hooks up to your ZX printed circuit board in minutes. No technical know how or soldering is required.

The ZX16K Memory Module will fix inside the case, using the new Adaptor Board at £9.75 or the Motherboard.
By removing the ZX PSU from its case this can also be fixed inside. We will carry out the installation work free of charge if required.

KEYBOARD LAYOUT:
All the Sinclair ZX81 keys are duplicated on our layout, with extra shift and new line keys. The professional momentary action key switches have a guaranteed life of 10^6 operations. The unit is fully built tested and comes complete with a money back guarantee.





INSTALLATION
Simply unscrew the ZX printed circuit board from its case and screw it into the FD Case.

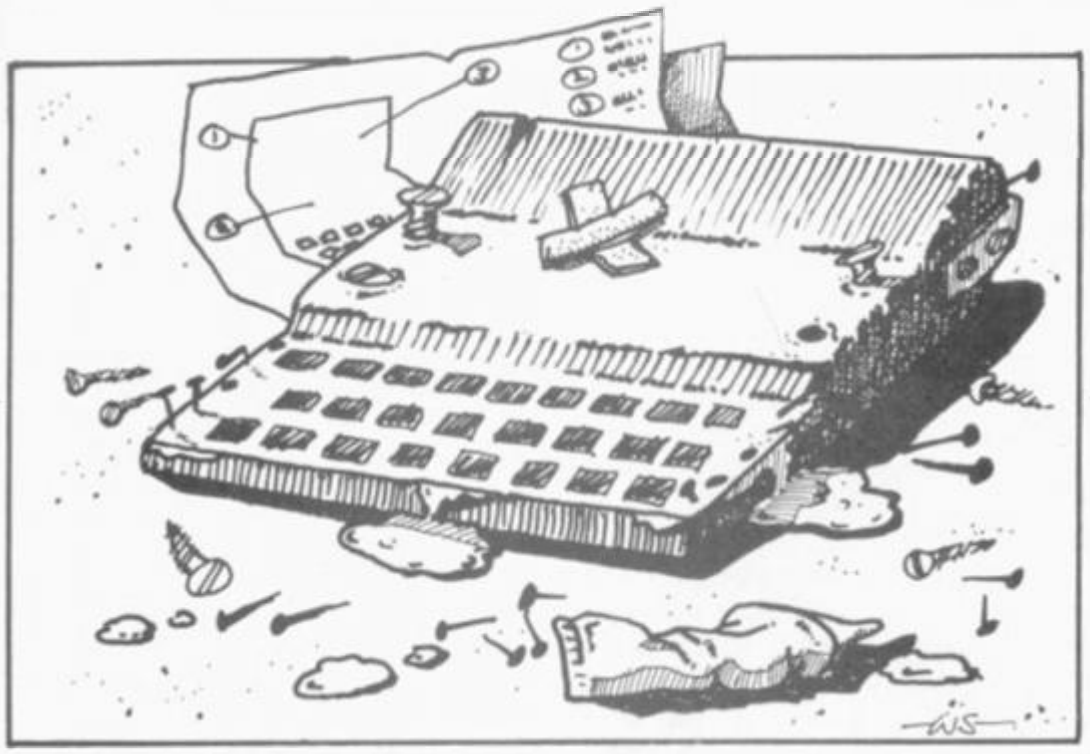
MOTHERBOARD:
We also manufacture a mother board which allows expansion to the ZX memory and 1/0 facilities WITHIN the case, as well as our power supply unit and reset switch.

AD Code ZXU		Price †	Qty	Amount
Fuller	FD System 42 Keyboard & case	39.95		
	FD System Motherboard	15.95		
	FD 16K. Memory Module	29.95		
	FD 64K. Memory Module	78.95		
	FD PSU 9 Volts at 2 amp.	12.95		
	FD *Shipping and Handling*	2.50		

Keyboard Only Available!
Built £24.95
Kit £18.95 (+P.P. 80p)

Mail to **FULLER MICRO SYSTEMS,**
The ZX Centre, Sweeting Street, Liverpool 2. England, U.K.
SAE for more details — Enquiries: Tel. 051-236 6109

Name .....
Address .....
City/State/Zip .....



Phil Garrett looks at routines which can assist in writing tidier systems.

Basic toolkits can help put polish on programs

WHEN I discussed reviewing ZX-81 utility programs with the editor, he was disappointed that all the debug programs operate only in machine code and that the Basic programmer is left to sink or swim. While it is true that there is nothing available to help unravel the mess of tortured logic in which my Basic programs finish, there are several programs which add extra facilities as they are written, and can make them look neater afterwards.

Even a program which is a jumble of embedded subroutines and GOTOs every other statement looks well-planned when all the line numbers increase in tens. Re-numbering is probably the main reason for the purchase of a toolkit program and is the only function included in every one at which I looked. The range of other functions offered is very wide and some of them seem to have been put in just to make a program appear more substantial, rather than because they are useful.

Hewson Consultants offers two programs, a straightforward **Renumber** and a more sophisticated **Toolkit**. Both can be used on ZX-81s with either the standard 16K RAM or with the increasingly-popular 48K and 64K RAM packs. They require the user to re-set RAMTOP before the program is loaded, which can be annoying, especially when you forget to do it.

Renumber takes 1K and a USR call re-numbers your Basic program in steps of five, starting from 5. Other values for the step size and starting number can be POKEd in and it will always re-number to the end of the program. The routine took about 50 seconds in Fast mode to re-number 5K of Basic.

A problem with which all the re-numbering programs have to cope somehow is the very useful but very non-standard Sinclair GOTO — and GOSUB. Our GOTO 1000 + 100*A and GOSUB X are seen in few, if any, other dialects of Basic, and are too sophisticated for a re-numbering program to cope with, so have to be tinkered with afterwards.

> 'All re-numbering programs have to cope with the very useful, but very non-standard, Sinclair GOTO and GOSUB.'

Another non-standard feature is the jump to a non-existent line number; Sinclair Basic simply continues looking until it finds a line, whereas most Basics will stop with an error if the line does not exist. A measure of the usefulness of a re-numbering program is what assistance it gives to the programmer in resolving those difficulties.

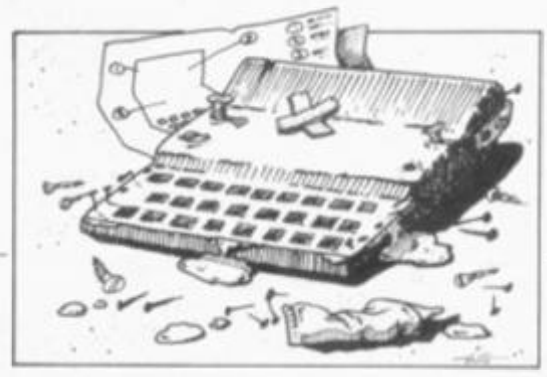
To return to the Hewson Renumber, computed GOTOs and jumps to non-existent lines are highlighted in reverse video after re-numbering. The arithmetic expressions — e.g., GOSUB 1000 + INT (10*RND + 1) — can appear rather distorted, so it would be as well to have a copy of the original program to which to refer.

Hewson's Programmers' Toolkit requires 3K above RAMTOP and includes routines to copy or delete blocks of Basic lines and a number of machine code monitor functions. The re-number works in much the same way as the previous program, except that an end number can also be given; the numbers are prompted for, rather than having to be POKEd in. The Toolkit seems to consist mainly of lines of Basic starting from 9000, which are added to your own Basic program with a USR call. RUN 9000 will then run the Toolkit, which displays a menu of functions. There is a hexadecimal loader and lister and a routine to copy bytes from one place to another. More useful are the functions which can display the line numbers of lines containing a particular string of characters or tokens you want to find — e.g., computed GOTOs — and REPLACE, which allows a string of characters to be exchanged for another of equal length. Both routines are slow to execute.

I did not find the program very robust; the hex lister did not work, the re-number duplicated line numbers when I set the increment too large, and the program crashed several times. The instructions for both programs are brief, but adequate. Renumber costs £4.95 and Programmers' Toolkit £6.50.

The JRS Software Toolkit also requires the user to re-set RAMTOP and takes 1K. A great deal has been packed into that 1K but ease of use

continued on p30



continued from p.29

seems to have fallen by the wayside. The re-number requires all statements such as GOTO 25 to be changed to GOTO 0025 before it will work. Computed GOTOs and jumps to non-existent lines are ignored completely. Starting line and increment can be changed with POKEs and the routine took eight seconds to re-number 5K.

There is a search-and-list function which could be used to find all occurences of GOTOs and GOSUBs, so that they could be changed to the required format. There are also search and replace and memory left routines, plus three graphics routines, Hyper graphics mode alters the start address of the ZX-81 ROM character table and produces interesting but useless effects; Fill fills a specified number of lines with a chosen character; and Reverse inverts as many lines on the screen as required.

At £4.95 the program demands a great deal of care and effort from the user, which surely is not the purpose for which utility programs are intended.

The ACS Software **Progstore** allows a small — fewer than 2,750 bytes — Basic program to be stored above RAMTOP. The program can then be called, with USR, and acts rather like a subroutine. Any variables used in the stored program must already exist.

On the other side of the tape are four small Toolkit programs which can be used with Progstore. **Hexloader** and **Hexlister** are obviously fillers and a waste of time; no addresses are shown, so it is difficult to interpret what appears on the screen. **Progmod-1** allows larger programs to be stored above RAMTOP by modifying Progstore. **Renumber** works only in steps of 10 from line 10 and, incredibly, the entire program will crash — and I mean a complete crash, not just stop — if it encounters a computed GOTO or jump to a non-existent line number.

The other ACS cassette contains **Progmerge**, which allows all or part of a Basic program to be stored above RAMTOP and then merged with a second program, the whole lot then being re-numbered. The instructions did not indicate what size of program could be stored and a 3K program I tried was too big. The renumbering, which can be run on its own, has the same limitations as the toolkit Renumber.

I was impressed with the ACS assembler and disassembler programs and so I was surprised at the poor quality of its re-number routine, which could be used only with the utmost care. The instructions are clear, with helpful examples. Progstore/Toolkit costs £7.50, and Progmerge £5.50.

ACS, however, has now brought out **Progmerge (version two)** which is said to have overcome the problems. The program costs £5.50 and anyone with the first version who wants it updating can have it done by ACS at a cost of £1 plus 25p for postage and packing.

> 'ZXED is a most impressive program, fast in execution, with clear and full instructions and helpful error codes'

At 4K, the dK'tronics **ZXED** toolkit is bigger than the others and re-sets RAMTOP automatically. The program is controlled from six lines of Basic 9990-9996 which are added to your program with a USR call; RUN 9990 starts the toolkit and gives an inverse E prompt, waiting for one of 11 commands. Whichever is chosen, full prompts are given and, if anything goes wrong, 10 special error codes will identify why and where it happened.

Renumber prompts for start and end line numbers, new base and increment. It then looks through the Basic and if it encounters a computed GOTO it will stop with report "Q/line no.". The user can then insert a REM into the offending line and continue with the re-numbering. Impressively, jumps to non-existent line numbers will be re-numbered correctly e.g., 5 REM 15 REM 25 GOTO 10 will become 10 REM 20 REM 30 GOTO 20. It took less than one second to re-number 5K of Basic.

Find will display the lines — not just the line numbers — containing a specified string, so it can be used to find the REM GOTO X lines after re-numbering, and Alter will replace a string. Blocks of lines can be copied, moved or deleted, stored above RAMTOP and re-inserted into another program. Bytes tells you the amount of free memory remaining.

It is a most impressive program, fast in execution, with clear and full instructions, and helpful error codes. At £6.95 for the cassette version and £9.95 for an EPROM version, it stands out from the rest of the field.

Unfortunately I was unable to load the last program, the Bug-Bytes **ZXTK** and the replacement copy arrived too late to be included in this review, which is a pity as it has some unusual functions. Sniff displays the file names of programs on a ZX-81 tape — that is useful if you've forgotten them; Where gives the address where a Basic line starts in memory; Rem creates a REM statement of specified length; Check generates a check number to ensure a program has loaded correctly. In addition, it has Renumber — which highlights computed and non-existent line GOTOs — Copy, Move, Extract — place above RAMTOP — and merge blocks of Basic. ZXTK costs £6.

Hewson Consultants, 7, Grahame Close, Blewbury, Didcot, Oxon OX11 9QE.
JRS Software, 19, Wayside Avenue, Worthing, Sussex BN13 3JU.
ACS Software, 7, Lidgett Crescent, Roundhay, Leeds LS8 1HN.
dK'tronics, 23, Sussex Road, Gorleston, Great Yarmouth, Norfolk.
Bug Byte Software, 98-100 The Albany, Old Wall Street, Liverpool L3 9EP.

PROGRAM PRINTOUT

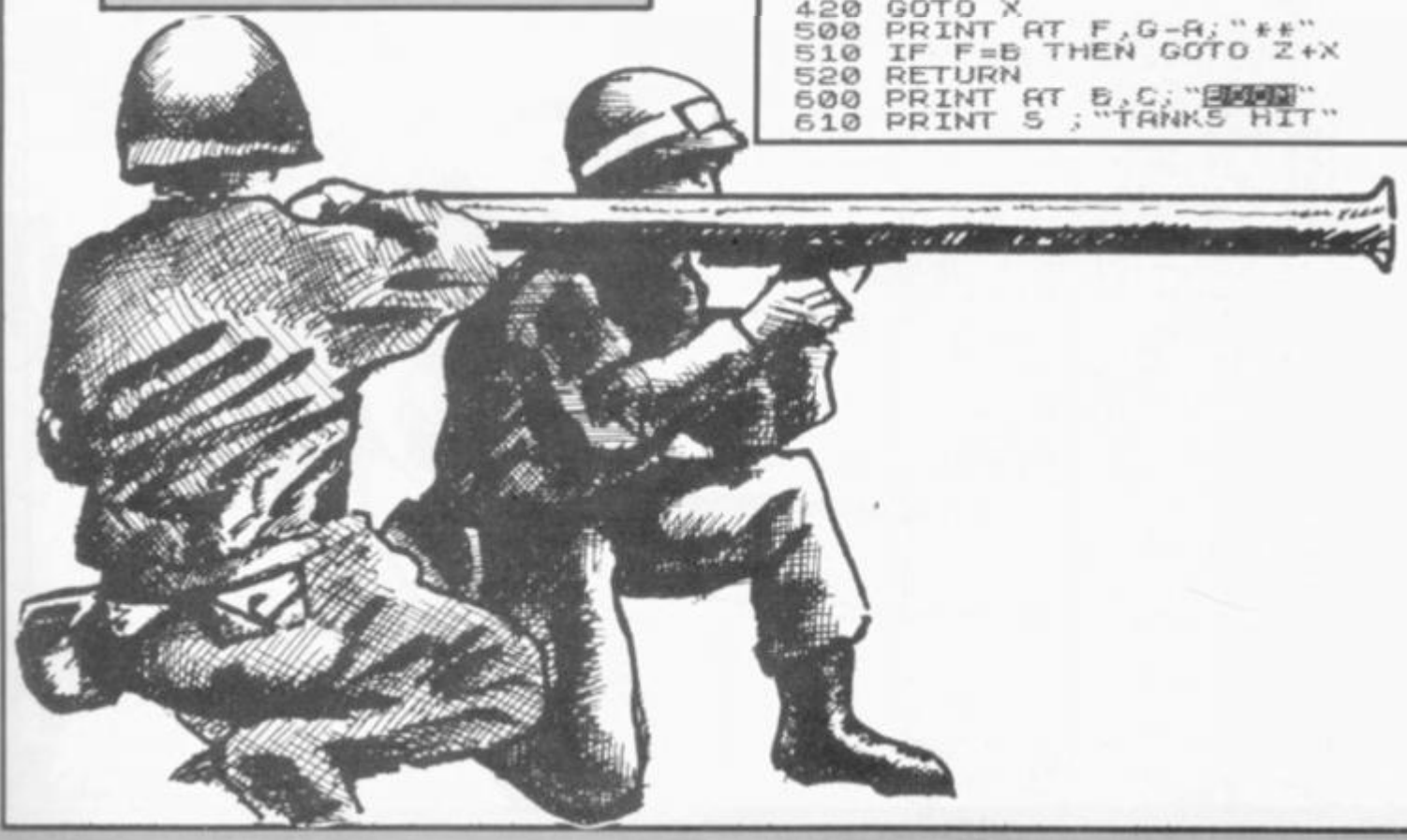
BAZOOKA

MANOEUVRE your **Bazooka** with keys 1 and Q, and fire at the oncoming tank with 0 before it can nail you with its own weapon.

A simple but effective game, submitted by A S Gale of Exeter. Perhaps its most distinctive feature is that it manages to produce both flicker-free graphics and an enemy which fights back — and that on a 1K ZX-81. Graphics notes:

40 — Graphic A
128 — Inverse minus, Inverse 0, graphic 5, space.
150 — Inverse shifted M
190 — Graphic 4, graphic 2
199 — Inverse space
200 — Space, shifted M
240 — Inverse shifted J
400 — Asterisk, O, graphic A
500 — Shifted H
600 — Inverse BOOM

```
  10 LET A=PI/PI
  20 LET C=PI-PI
  30 LET S=C
  40 LET B=CODE "▒"
  50 LET X=VAL "100"
  60 LET Y=CODE "COS "
  70 LET Z=VAL "500"
 100 CLS
 105 LET F=INT (RND*CODE "?")
 110 LET G=CODE "."
 128 PRINT AT F,G;"▪▫ "
 130 LET G=G-A
 140 IF G<=C THEN GOTO X
 150 PRINT AT B-A,C;" ";AT B+A,C
;" ";AT B,C;"▒"
 155 LET G=G
 160 IF INKEY$="1" THEN LET B=B-
A
 170 IF INKEY$="Q" THEN LET B=B+
A
 180 IF INKEY$="0" THEN GOTO Y
 190 IF INT (RND*CODE "▪")=CODE
"▪" THEN GOSUB Z
 199 GOTO CODE "▪"
 200 PRINT AT B,D;" ›"
 210 LET D=D+A
 220 IF D<G THEN GOTO Y
 230 IF B=F AND D=G THEN GOTO Y+
Y
 240 GOTO CODE "▬"
 400 PRINT AT F,G+A;"*O▒"
 405 PRINT AT F,G+A;"▪▪▪"
 410 LET S=S-A
 420 GOTO X
 500 PRINT AT F,G-A;"▪▪"
 510 IF F=B THEN GOTO Z+X
 520 RETURN
 600 PRINT AT B,C;"▒▒▒▒"
 610 PRINT S ;"TANKS HIT"
```



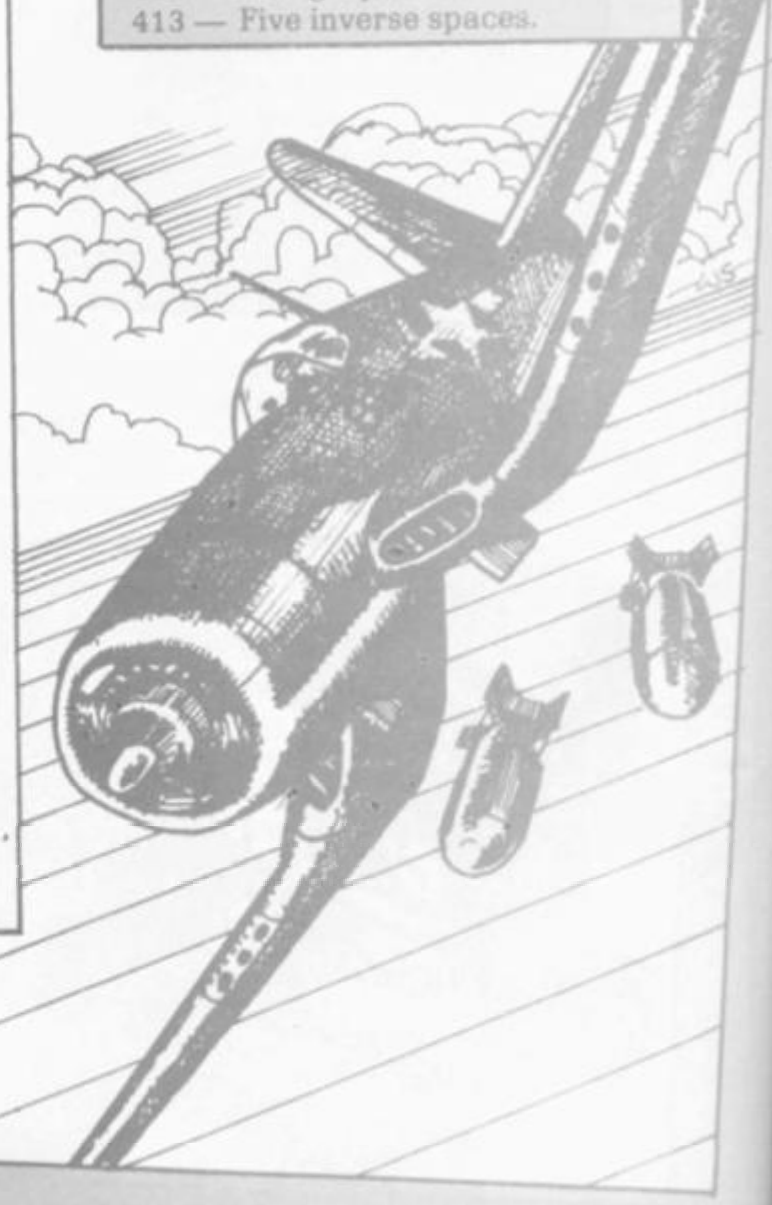
AIR-SEA ATTACK

```
KEYS 5 AND 8 CONTROL THE
CURSOR

KEY 0 RELEASES THE TORPEDO


    1 REM AIR SEA ATTACK
    2 LET X=0
    3 LET X1=0
    4 LET V=10
    5 LET W=15
    8 LET HITS=156
    9 FOR N=10 TO 21
   10 PRINT AT N,0;"
                                  "
   15 NEXT N
   16 PRINT AT 21,0;"HITS TO GO:
0"
   17 GOTO 190
   18 LET X=X+1
   19 IF M=0 THEN LET Q=X
   21 LET X=X-X*(X=30)+30*(X=-1)
   30 PRINT AT 0,X;" "
   31 IF X=29 THEN PRINT AT 0,29;
" "
   32 LET X1=X1+(INKEY$="8")-(INK
EY$="5")
   33 IF X1<0 THEN LET X1=0
   34 IF X1>28 THEN LET X1=28
   35 PRINT AT 20,X1;" "
   36 IF V=28 THEN LET W=INT (RND
*9)+11
   40 LET V=V+1
   41 LET V=INT V-V*(V=29)+29*(V=
-V)
   42 PRINT AT W,V;"  "
   43 IF V=28 THEN PRINT AT W,28;
"  "
   44 IF INKEY$="0" THEN LET M=1
   46 IF M=1 THEN GOTO 100
   50 GOTO 18
  100 LET X0=X1-Q
  110 LET Y=21
  120 LET Z=ABS X0
  130 IF ABS Y>Z THEN LET Z=ABS Y
  140 LET F=F+1
  142 LET FR=(W=H)+(V=INT G+Q)+(V
+2=INT G+Q)+(V+3=INT G+Q)
  143 IF FR>=2 THEN GOTO 2400
  145 IF H<=9 THEN PRINT AT H,G+Q
;"*"
  149 IF H>=10 THEN PRINT AT H,G+
Q;"*"
  151 IF H<=9 THEN PRINT AT H,G+Q
;" "
  152 IF H>=10 THEN PRINT AT H,G+
Q;" "
  160 LET G=G+X0/Y
  170 LET H=H+Y/Z
  185 IF F<Z-1 THEN GOTO 18
  190 LET M=0
  191 LET G=0
  192 LET H=0
  194 LET C=0
  195 LET F=0
  200 GOTO 18
  400 REM SCORE
  410 LET HITS=HITS+1
  411 FOR N=1 TO 20
  412 PRINT AT W,V;"  "
  413 PRINT AT W,V;"  "
  414 NEXT N
  420 PRINT AT 21,12;CHR$ HITS
  430 IF HITS=160 THEN GOTO 500
  437 LET FR=0
  438 LET V=0
  439 FOR N=1 TO 30
  440 NEXT N
  442 PRINT AT 0,X;"   "
  445 LET X=X+INT (RND*3)+1
  446 GOTO 190
  500 PRINT AT 21,0;"PRESS N/L TO
 PLAY AGAIN"
  510 INPUT A$
  515 CLS
  520 GOTO 1
```

THIS IS a distinctly topical sub-hunt game, submitted by M Thurston of Manchester, in which a torpedo is dropped from a patrolling aircraft and homes-in on the cursor C. The cursor is manoeuvred so that it draws the torpedo into the path of the submarine.

Since the movements of three separate points — submarine, aircraft and torpedo — must be correlated, a high degree of skill is involved. In addition, the depth of the submarine varies by a random value. The graphics are strong and pleasing. (16K ZX-81). Graphics notes:

10 — Thirty-two inverse spaces.
30 — Space, inverse shifted M.
35 — Inverse space, inverse C, inverse space.
42 — Inverse space, graphic G, graphic H, graphic G, inverse space.
43 — Four inverse spaces.
149 — Inverse asterisk.
151 — Space.
152 — Inverse space.
412 — Five graphic Hs.
413 — Five inverse spaces.



```
  10 LET L=CODE " "
  20 LET A=CODE "■"
  30 LET B=A
  40 LET M=A
  50 LET I=CODE "("
  60 PRINT "■■■
```

FROGGER

```
  1 REM "LEAP FROG"
  2 REM COPYRIGHT P.HAMMOND  MA
Y 1982
  3 PRINT AT 11,4;"L  E  A  P
F  R  O  G"
  4 PAUSE 100
  5 CLS
  6 PRINT "DO YOU WANT INSTRUCT
IONS ?"
  7 INPUT P$
  8 IF P$="y" THEN GOSUB 8999
  9 CLS
 10 LET H=0
 12 LET H=H
 14 LET F=1
 15 LET S=0
 16 LET E=20
 17 LET F=F
 18 PRINT AT 21,3;"FRAME ";F
 19 PRINT AT 21,15;"SCORE ";S
 20 LET S=S
 95 LET C=INT (RND*25)+3
100 FOR A=0 TO 3
105 LET E=E-2*(INKEY$="7")
106 LET C=C-2*(INKEY$="5")+2*(I
NKEY$="8")
107 PRINT AT E,C;"■"
108 IF C>28 THEN LET C=28
109 IF C<5 THEN LET C=5
110 GOSUB 2500
115 GOSUB 5000
118 IF E<=0 AND E=CODE " " THEN
GOTO 2000
119 IF INKEY$="7" THEN LET S=S+
10
120 PRINT AT 21,15;"SCORE ";S
125 IF E<14 THEN GOTO 509
130 IF E>16 THEN GOTO 509
140 IF E=16 THEN GOSUB 3000
150 IF E=14 THEN GOSUB 3120
400 GOSUB 4000
510 PRINT AT 0,A;"
511 PRINT AT 2,0;"
T 12,0;"
AT 19,6;"HIGH SCORE: ";H;AT 20,0
512 PRINT AT 4,A;"
513 PRINT AT 6,A;"
514 PRINT AT 8,A;"
515 PRINT AT 10,A;"
519 PRINT AT 14,6;"
520 PRINT AT 16,6;"
530 NEXT A
540 IF A+23>=31 THEN GOTO 550
545 IF A+23>=0 THEN GOTO 100
550 FOR A=8 TO 0 STEP -1
551 PRINT AT E,C;"■"
552 IF C>28 THEN LET C=28
553 IF C<5 THEN LET C=5
555 LET E=E-2*(INKEY$="7")
556 LET C=C-2*(INKEY$="5")+2*(I
NKEY$="8")
558 GOSUB 2500
560 IF E<=0 AND E=CODE " " THEN
GOTO 2000
567 GOSUB 5000
568 IF INKEY$="7" THEN LET S=S+
10
569 PRINT AT 21,15;"SCORE ";S
570 IF E<14 THEN GOTO 1600
575 IF E>16 THEN GOTO 1600
580 GOSUB 3000
590 GOSUB 4000
1600 GOTO 509
2000 PRINT AT E,C;"MISSED"
2004 PRINT AT 21,15;"SCORE ";S
2006 GOTO 9500
2500 IF E<=0 AND C=A+2 THEN GOTO
 2510
2501 IF E<=0 AND C=A+3 THEN GOTO
 2510
2502 IF E<=0 AND C=A+8 THEN GOTO
 2510
2503 IF E<=0 AND C=A+9 THEN GOTO
 2510
2504 IF E<=0 AND C=A+14 THEN GOT
O 2510
2505 IF E<=0 AND C=A+15 THEN GOT
O 2510
2506 IF E<=0 AND C=A+20 THEN GOT
O 2510
2507 IF E<=0 AND C=A+21 THEN GOT
O 2510
2508 RETURN
2510 LET F=F+1
2512 PRINT AT E,C;"■"
2515 PRINT AT 21,15;"SCORE ";S
```

THIS VERSION of the arcade game **Frogger** was submitted by P Hammond of Ipswich. The idea is to jump the frog across a lily pond, dodge the speeding cars on a motorway, and lead it to safety in one of the moving froggy rest-homes on the other side.

Features include a running display of scores, instructions on request and a pleasing range of wipe-out logos — pond, motorway and frog-homes give Plop, Splat and Missed respectively.

Your frog is prodded into action with keys 5, 7 and 8 and earns you a bonus for every frame it manages to heave itself across. Graphic notes:

107 — Inverse F.
510 — Graphic 5, two graphic As, graphic 8.
512 — Inverse C.
519 — Inverse L.
551 — Inverse F.
2521 — Inverse F.

```
5080 IF E=8 AND C=A+10 THEN GOTO
 5400
5090 IF E=8 AND C=A+14 THEN GOTO
 5400
5100 IF E=8 AND C=A+18 THEN GOTO
 5400
5110 IF E=8 AND C=A+22 THEN GOTO
 5400
5120 IF E=10 AND C=A+1 THEN GOTO
 5400
5130 IF E=10 AND C=A+8 THEN GOTO
 5400
5140 IF E=10 AND C=A+15 THEN GOT
O 5400
5150 IF E=10 AND C=A+22 THEN GOT
O 5400
5300 RETURN
5400 PRINT AT E,C;"SPLAT"
5401 PRINT AT 21,15;"SCORE ";S
5402 GOTO 9500
8999 CLS
9000 PRINT AT 0,11;"LEAP FROG"
9001 PRINT AT 3,3;"YOU MUST JUMP
 YOUR FROG:""■"";"
9002 PRINT AT 4,0;"OVER THE LILY
 PADS:""■"" TO THE"
9003 PRINT AT 5,0;"MOTORWAY. YOU
 HAVE TO CROSS THE"
9004 PRINT AT 6,0;"ROAD,AVOIDING
 THE CARS (WHICH"
9005 PRINT AT 7,0;"KEEP CHANGING
 DIRECTION),"
9006 PRINT AT 8,0;"TO GET THE FR
OG HOME:""▐▀▀▀▌"";"
9007 PRINT AT 10,3;"ONLY FORWARD
 MOVEMENT SCORES"
9008 PRINT AT 11,0;"BUT YOU GET
A BONUS OF 100 FOR"
9009 PRINT AT 12,0;"EACH FRAME C
LEARED"
9010 PRINT AT 14,0;"MOVEMENT KEY
S ARE:""5"","";""7"";"AND"";""8"""
9011 PRINT AT 16,0;"PRESS N/L WH
EN YOU""RE READY"
9012 PAUSE 4E4
9013 IF INKEY$="" THEN CLS
9014 RETURN
9500 PAUSE 200
9501 IF H<S THEN LET H=S
9510 CLS
9519 PRINT "DO YOU WANT ANOTHER
GO ?"
9520 INPUT Y$
9530 IF Y$="Y" THEN GOTO 12
9540 STOP
```

```
2520 PAUSE 75
2525 LET S=S+100
2530 CLS
2535 GOTO 16
3000 IF E=16 AND C=6 THEN GOTO 5
09
3001 IF E=16 AND C=9 THEN GOTO 5
09
3002 IF E=16 AND C=12 THEN GOTO
509
3003 IF E=16 AND C=15 THEN GOTO
509
3004 IF E=16 AND C=18 THEN GOTO
509
3005 IF E=16 AND C=21 THEN GOTO
509
3006 IF E=16 AND C=24 THEN GOTO
509
3007 IF E=16 AND C=27 THEN GOTO
509
3120 IF E=14 AND C=6 THEN GOTO 5
09
3121 IF E=14 AND C=9 THEN GOTO 5
09
3122 IF E=14 AND C=12 THEN GOTO
509
3123 IF E=14 AND C=15 THEN GOTO
509
3124 IF E=14 AND C=18 THEN GOTO
509
3125 IF E=14 AND C=21 THEN GOTO
509
3126 IF E=14 AND C=24 THEN GOTO
509
3127 IF E=14 AND C=27 THEN GOTO
509
4000 PRINT AT E,C;"PLOP"
4001 PRINT AT 21,15;"SCORE ";S
4002 GOTO 9500
5000 IF E=4 AND C=A+1 THEN GOTO
5400
5010 IF E=4 AND C=A+8 THEN GOTO
5400
5020 IF E=4 AND C=A+15 THEN GOTO
 5400
5030 IF E=4 AND C=A+22 THEN GOTO
 5400
5040 IF E=6 AND C=A+1 THEN GOTO
5400
5050 IF E=6 AND C=A+5 THEN GOTO
5400
5060 IF E=6 AND C=A+9 THEN GOTO
5400
5070 IF E=6 AND C=A+13 THEN GOTO
 5400
```

TOWERS of HANOI

THIS game is from the mysterious east via Simon Annetts of Rhayader, Powys. It is velly, velly good.

Your Sinclair will erect three pegs and on the centre peg will place six rings in order of descending size. Your task is to transfer the rings one by one until they are all assembled in the correct order on one of the other pegs.

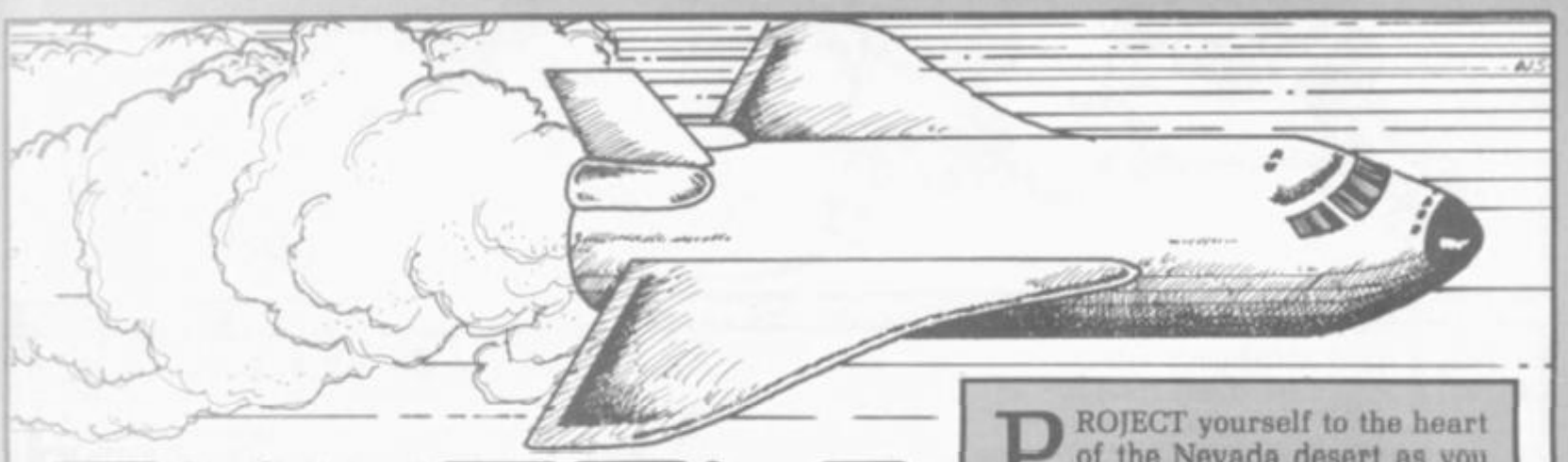
You cannot place a bigger ring on a smaller one and the computer will chastise you if you try. An excellent little game which went immediately on to the office tape. Graphics notes:
30 — 32 graphic shifted 8s.
50 — Three spaces, graphic shifted 8, 7 spaces, graphic shifted 8, seven spaces, graphic shifted 8.
67 — Three spaces, graphic shifted 8.
70 — Three spaces, inverse space, graphic shifted 5.
80 — Two spaces, graphic shifted 8, two inverse spaces.
90 — Two spaces, three inverse spaces, graphic shifted 5.
100 — One space, graphic shifted 8, Two inverse spaces.
110 — One space, five inverse spaces, graphic shifted 5.
120 — Graphic shifted 8, six inverse spaces.

```
  10 REM "TOWERS OF HANOI"
  20 CLS
  30 PRINT AT 20,0;"
"
  35 PRINT AT 21,5;"1";TAB 16;"2
";TAB 24;"3"
  40 FOR X=10 TO 19
  50 PRINT AT X,5;"     ▌     ▌
     ▌"
  60 NEXT X
  61 DIM A(3,7)
  65 DIM A$(7,5)
  67 LET A$(1)="     "
  70 LET A$(2)="    "
  80 LET A$(3)="   "
  90 LET A$(4)="  "
 100 LET A$(5)=" "
 110 LET A$(6)="  "
 120 LET A$(7)="   "
 130 FOR Z=7 TO 1 STEP -1
 135 LET A(1,Z)=1
 140 LET A(2,Z)=2
 145 LET A(3,Z)=1
 150 NEXT Z
 155 LET C=1
 160 FOR Z=1 TO 3
 170 FOR Y=7 TO 1 STEP -1
 180 PRINT AT Y+12,Z*8-3;A$(A(Z,
Y))
 190 NEXT Y
 195 NEXT Z
 201 PRINT AT 0,24;"MOVE:";C
 205 IF A(1,2)=2 OR A(3,2)=2 THE
N GOTO 2000
 206 PRINT AT 0,0;"                "
 210 PRINT AT 0,0;"FROM ?"
 220 INPUT J
 230 PRINT AT 0,0;J;" TO ?"
 240 INPUT K
 250 PRINT AT 0,0;J;" TO ";K
 255 IF J>3 OR J<1 OR K>3 OR K<1
 THEN GOTO 1000
 260 IF K=J THEN GOTO 1000
 270 FOR D=1 TO 7
 280 IF A(J,D)=1 THEN GOTO 320
 290 LET P=D
 300 LET Q=A(J,D)
 310 GOTO 340
 320 NEXT D
 330 GOTO 1000
 340 FOR D=1 TO 7
 350 IF A(K,D)=1 THEN GOTO 370
 360 IF A(K,D)<Q THEN GOTO 1000
 365 IF A(K,D)>1 THEN GOTO 380
 370 NEXT D
 380 LET D=D-1
 390 LET A(K,D)=A(J,P)
 400 LET A(J,P)=1
 410 LET C=C+1
 420 GOTO 160
1000 FOR U=0 TO 20
1010 NEXT U
1020 PRINT AT 0,0;"INVALID MOVE"
1030 FOR U=0 TO 30
1040 NEXT U
1050 GOTO 205
2000 PRINT AT 0,0;"YOU HAVE COMP
LETED THE TOWERS OF HANOI IN";C-
1;"MOVES"
2010 PRINT
2020 PRINT "TRY AGAIN?"
2030 INPUT S$
2040 IF S$="YES" OR S$="Y" THEN
RUN
2050 STOP
```

INTEREST CALCULATION

DOES INTEREST interest you? If so, so will a program submitted by Christopher Green of Stratford-on-Avon. Enter the amount, the percentage, the length of time involved, and the settlement period — the intervals at which payments are due — and the computer will crunch until your eyes scroll.

```
    5 REM "INTEREST CALCULATION"
   10 PRINT "ENTER THE AMOUNT CON
CERNED"
   30 INPUT A
   40 PRINT "ENTER THE PERCENTAGE
 PER ANNUM"
   50 INPUT B
   60 PRINT "ENTER THE YEARS, THE
N THE MONTHS"
   70 INPUT C
   80 INPUT E
   90 LET D=C*12+E
  100 PRINT "ENTER THE SETTLEMENT
 PERIOD IN MONTHS"
  110 INPUT F
  120 LET DD=D/F
  130 FOR G=1 TO INT D
  140 LET H=INT ((A*(B*F/12))/100
  150 PRINT "PERIOD ";G;":£";A;"+
";B;"0/0=£";A+H
  160 LET A=A+H
  170 IF PEEK 16442<=2 THEN SCROL
L
  180 NEXT G
  190 PRINT "PRESS ANY KEY TO CON
TINUE"
  200 IF INKEY$="" THEN GOTO 200
  210 CLS
  220 GOTO 10
```



SHUTTLE

```
   10 LET D=VAL "15"
   20 LET K=VAL "D<>D"
   30 LET S=VAL "K"
   40 LET F=VAL "K"
   50 FOR L=VAL "1" TO VAL "12"
   60 PRINT AT (RND*VAL "5")+VAL
"16",RND*VAL "20";"▒"
   70 NEXT L
   80 PRINT AT VAL "21",VAL "25";
"▒▒▒▒▒"
  100 PRINT AT D,F;"▙▟";AT D,F+V
AL "3";
  120 GOTO 200+(200 AND (PEEK (PE
EK (16398)+256*PEEK (16399))=5)
+(200 AND F=26)+(200 AND F<25 AN
D D=21)+(400 AND F=25 AND D=21)
  200 PRINT AT D,F;"  "
  201 LET D=D+(INKEY$<>"7")-(INKE
Y$="7")
  205 LET F=F+VAL "1"
  210 IF INKEY$="7" THEN LET S=S+
VAL "1"
  230 GOTO VAL "100"
  400 PRINT AT D,F;"*▒*";E
 1000 PRINT AT K,K;"YOU WIN FUEL
USED=";S
```

PROJECT yourself to the heart of the Nevada desert as you steer 'the heaviest glider in the world' to a safe landing.

It is a **Land the Space Shuttle** game, submitted by G Banks, of Wakefield, West Yorkshire.

The display features the shuttle drifting down diagonally from left to right, through a number of obstacles, low-flying vultures or loosened thermal tiles, perhaps. A stab on the 7 key will boost the shuttle temporarily to a higher altitude while still keeping it on line, you hope, for the landing pad on the right of the screen.

The game is suitable for an unexpanded ZX-81, though you will find yourself running out of memory periodically and in need of the CONT button. Graphic notes:

60 — Graphic A.
80 — Three graphic Ds.
100 — Graphic W, Graphic 6, Inverse space, graphic W.
400 — Asterisk, inverse asterisk, asterisk.

LIMERICK WRITER

THERE WAS A young fellow
from Lancs.,
Who sent us a program which
ranks
As the best of all time
For churning out rhyme
And it hereby is printed with
thanks.

The basics of an excellent program. Your own ingenuity — or genius — is the limit.

Submitted by Jonathan Finstein of Salford, Lancashire. (16K ZX-81)

```
    4 REM "PU"
    5 CLS
    6 LET A=0
    7 LET B=0
    8 LET A=A+1
    9 IF A=6 THEN GOTO 200
   10 LET A$="THERE WAS A YOUNG M
AN FROM "
   20 LET B$="WHO "
   30 LET C$="HIS "
   40 LET D$="ONE NIGHT AFTER DAR
K "
   50 LET E$="AND HE NEVER WORKED
 OUT "
   55 LET B=B+1
   60 LET N=INT (RND*4)+1
   70 IF A=1 THEN PRINT ;A$;
   71 IF B=1 AND N=1 THEN PRINT ;
"                                TA
SHKENT"
   72 IF B=1 AND N=2 THEN PRINT ;
"TRENT"
   73 IF B=1 AND N=3 THEN PRINT ;
"KENT "
   74 IF B=1 AND N=4 THEN PRINT ;
"GHENT"
   77 IF A=2 THEN PRINT ;B$;
   78 IF B=2 AND N=1 THEN PRINT ;
"URAPPED UP ";
   79 IF B=2 AND N=2 THEN PRINT ;
"COVERED ";
   80 IF B=2 AND N=3 THEN PRINT ;
"PAINTED ";
   81 IF B=2 AND N=4 THEN PRINT ;
"FASTENED ";
   82 IF A=3 THEN PRINT ;C$;
   83 IF B=3 AND N=1 THEN PRINT ;
"HEAD ";
   84 IF B=3 AND N=2 THEN PRINT ;
"HAND ";
   85 IF B=3 AND N=3 THEN PRINT ;
"DOG ";
   86 IF B=3 AND N=4 THEN PRINT ;
"FOOT ";
   87 IF B=3 THEN LET B=B+1
   88 IF B=4 AND N=1 THEN PRINT ;
"IN A TENT"
   89 IF B=4 AND N=2 THEN PRINT ;
"                          WITH CEME
NT"
   90 IF B=4 AND N=4 THEN PRINT ;
"                                THAT
 WAS BENT"
  100 IF B=4 AND N=3 THEN PRINT ;
"                                WITH S
OME SCENT"
  120 IF A=4 THEN PRINT ;D$
  130 IF B=5 AND N=1 THEN PRINT ;
"IT RAN OFF ";
  131 IF B=5 AND N=2 THEN PRINT ;
"IT GLOWED ";
  132 IF B=5 AND N=3 THEN PRINT ;
"IT BLEW UP ";
  133 IF B=5 AND N=4 THEN PRINT ;
"IT TURNED BLUE ";
  140 IF B=5 THEN LET B=B+1
  141 IF B=6 AND N=1 THEN PRINT ;
"IN THE PARK"
  142 IF B=6 AND N=2 THEN PRINT ;
"LIKE A QUARK "
  146 IF B=6 AND N=3 THEN PRINT ;
"FOR A LARK"
  147 IF B=6 AND N=4 THEN PRINT ;
"WITH A BARK";
  150 IF A=5 THEN PRINT ;E$;
  170 IF B=7 AND N=1 THEN PRINT ;
"                                WHERE
 IT WENT"
  171 IF B=7 AND N=2 THEN PRINT ;
"                                   IT
S INTENT"
  172 IF B=7 AND N=3 THEN PRINT ;
"                                WHY
 IT WENT"
  173 IF B=7 AND N=4 THEN PRINT ;
"                                WHAT
IT MEANT"
  190 GOTO 8
  200 PRINT
  205 PRINT "COPY?(Y OR N)"
  210 INPUT V$
  215 IF V$="Y" THEN COPY
  220 PRINT ;"DO YOU WANT ANOTHER
?(Y OR N)"
  230 INPUT Z$
  250 IF Z$="Y" THEN GOTO 6
  300 STOP
  310 SAVE "PU"
  320 RUN 5
```

Stephen Adams looks at the Data-Assette ZX-99 and finds it good but that it could involve a lot of expense.

Control system boosts power

THE ZX-99 is a control system for up to four different tape recorders which also has an RS232 tape interface for running a printer. The tape commands are all stored in a 2K ROM between 8K and 10K but the total area used is the whole of the 8K section between 8K and 16K. That is because of the way the ZX-99 divides the tape recorders — there must be at least two to make a sensible system — into INPUT and OUTPUT tape recorders. The two input sockets are selected individually and one lead is provided with the ZX-99 to connect the EAR and REMOTE sockets on the tape recorder. The normal cassette leads are plugged from the ZX-81 into the ZX-99 at the top and all of the SAVEing and LOADing is done through the ZX-99.

There is a 50-page manual with the ZX-99 and it is well worth reading before starting. It is well-written and contains not only a chapter on all of the commands but example programs, problems which may occur and any peculiarities of the system.

The commands are in the form of USR calls to various parts of the 2K ROM which can either be used direct from the keyboard or within a program. It is very easy to use in Basic but it requires the use of several variables to be set up for use by the ZX-99 before the USR commands are used.

These are a single-dimensioned string (DIMX$(300)), Z$, Z and Y. The dimensioned string can be any single letter and is used to store the data to be sent or received from the tape. Z$ is used to tell the ZX-99 which string is used for the buffer — i.e., Z$ = "X" — and variable Z the length of that buffer string to be sent. The Y variable is used to control the printing operations of the RS232 interface.

The variables can be put to other uses in the program but must be filled with the correct data for the ZX-99 before doing a USR command, or an error code will stop the program. There is also a "completion code" in the form of an error report when LET L = USR 1234 is used. Variable L can be checked if there has been a fault, as the report will be 0 if all is well.

One of the useful extras provided by the code is a check of the quality of a program which has been read back from the tape by the ZX-99. It consists of checking for three common errors — too high a level, too low a level, and varying tape speed giving longer pulses than are to be expected. A number which gives the sum of the three errors is returned in the completion code if they are found. The USR commands provide the following functions:

- Turn on the tape drive of any one input or turn on either or both of the tape drive outputs.
- Read or write a data buffer of length Z into or out of the tape recorder. On output, two copies can be made if required, one from each output.
- Skip the next block of data or program on tape.
- LOAD a program into the ZX-81 memory from an input tape drive and then SAVE it again on to one or more output tape recorders.
- Print-out a data buffer to an RS232 printer. Y defines speed, number of stop bits, parity and a choice of upper- or lower-case printing of the Sinclair character set. All codes sent to the printer

continued on page 40

'One of the useful extras provided by the code is a check of the quality of a program which has been read back from the tape.'

continued from page 39

are in ASCII and the user can define any ASCII character.

- Print a full list of a Basic program to the RS232 printer. No controls are provided — only the data and the common. Graphic characters are printed as ASCII codes.

The RS232 can be used only with a printer, as only an output on 3.5mm. jack is provided. All the ASCII control and other codes, including upper- and lower-case, can be generated from the keyboard or from within a program. When using a data buffer to print-out a string of characters, carriage return and line feed are separate but <> will produce both for a new line.

The length of the printed list is limited only by the maximum length the printer can print, so long lines will look completely different on the printer. The speed at which the printer can work can be between 110 and 9,600 baud but the RS232 port expects to print at full speed, so the printing speed must be adjusted to that with which the printer can cope.

The graphics characters in a ZX-81 program are all converted into ASCII characters and are printed as such. That means that as some of the graphics correspond to control characters it could cause some weird effects on the printer, such as double-sided characters and graphics dots. The only way to avoid that is to convert all the graphics into CHR$(×) but that wastes memory.

On the latest models, when LISTing the program, the graphics characters have been converted to spaces, enabling the user to fill-in the gaps with the appropriate graphic when the printing had been completed.

The original ZX-99s did not do that, causing problems in the LISTing. Data-Assette has offered a new ROM to people who bought the original model.

That does not apply when printing a data buffer, of course, as CR/LF can be done at any time along the entire length of the printer. One useful thing in the LIST routine is that it generates a blank line after single GOTOs, GOSUBs or RETURNs, showing the end of a routine.

> 'Non-restoration of slow mode on return to Basic is also annoying.'

The tape LOADing and SAVEing are done at the same speed and in the same way, using Sinclair ROM routines, so there is no increase in speed. The fact that five seconds of blank tape is recorded between each piece of data also means that is better only to SAVE to tape large amounts of data, otherwise the data records take so long to load.

CLS is also recommended to be used during data recording, otherwise that causes noise in the silent part of the tape. A data limit of 40 bytes is also imposed on the user as the minimum the system will put on to tape.

Block skip will check and report tape errors but will not verify the data against the program in memory. COPYing a program overwrites all the system variables, so a re-start is made after one program has been copied, thus NEWing any program in memory. BREAK is recognised throughout all the routines and will revert to a Basic listing as normal, except on COPY.

The ZX-99 has some very good features to build into programs where data needs to be written to and read from a cassette tape. Unfortunately that does not improve the speed of transfer, as the same tape system is used. The minimum requirement is two tape recorders at once, which may prove a strain on some budgets, as well as the cost of the ZX-99, which is £62.90 including VAT and postage.

The printer routines included are very useful for doing reports and graphics on a real paper printer, as the printer is under complete user control. The differences in appearance, such as the representation of lower-case by inverse letters on the screen and the limit of 32 characters per line on the ZX-81, would have to be solved by the program.

The non-restoration of slow mode on return to Basic is also annoying, as the ZX-99 works only in fast mode, for obvious timing reasons.

In all, a very good tape control and printer system. The ZX-99 can be bought by contacting Data-Assette at 44 Shroton Street, London NW1 6UG. 01-258-0409.

KEMPSTON MICRO ELECTRONICS

PRESENTING THE NEW . . .

ZX KLIK - KEYBOARD

IF YOU ARE like many ZX81 users and are fed up with the dead 'touch sensitive' key pad then consider the advantages of the new KEMPSTON KLIK-KEYBOARD. This is a genuine push button keyboard which has been designed as an exact replacement, being no larger than the existing key pad, but offering all the advantages of a full size keyboard. Consider these facts:

- Fits on to the ZX81.
- No soldering needed on the assembled version (just plug in)
- No trailing wires.
- No special case required.
- Positive feedback from keys.
- Full two colour legends supplied.
- Full back-up service offered, including fitting.

This is a genuine 40-key, push button keyboard which fits into the recess formed after peeling off the existing touch sensitive keypad.

The kit comes with a precision drilled P.C.B. finished in matt black, 40 keys, 2 colour legends, connecting tails, adhesive pads and a full set of instructions.

STOP PRESS. . STOP PRESS. . STOP PRESS
NewSinclair Spectrum H/W 24 line input-output Port has now been developed, allowing access to the outside world. Using a single in or out instruction — S.A.E. for further info.

Also available from our range of products is a Parallel User I/O post £16.50 built & tested. Gives 16 I/O lines to drive light relays, motors etc. Many already sold to education. Keyboard bleeper £8.95 built.

Your Name and Address _____

Date

Quantity	Description	Unit price		Amount	
	ZX81 Keyboard Kit	£22	50		
	ZX81 Keyboard Assembled	£26	00		
			Sub total		
			Carriage	-	70
			Total due		

Please allow 14 days for delivery
Kempston Micro Electronics
(80 Ader mason Court, Hilgrounds Road, Kempston, Beds MK42 8QZ

Proprietor A. Pandaal, B.Sc., P.G. Cert. Ed.

sinclair user

What is the best way to guarantee that you never become bored with your Sinclair computer?
The answer is to subscribe to *Sinclair User*, written specifically for owners of ZX-80s, ZX-81s and Spectrums. *Sinclair User* is the latest montly from ECC Publications — pioneers of Practical Computing, WHICH COMPUTER?, and Computer & Video Games. Whether you bought your system yesterday or are an old hand, you are probably an enthusiast for your machine ad your biggest problem is likely to be obtaining all the information to satisfy your interest. *Sinclair User* is devoted to quenching your thirst for information.
As the name suggests, the content is geared specifically to helping you, the user. There are pages of information on available hardware and software. Our aim is to make *Sinclair User* invaluable and we chronicle applications which are of special interest.

Make sure you get it each month

Can you continue to obtain the most from your Sinclair without reading *Sinclair User* every month? So why not fill the subscription order form **today?** Send it to *Sinclair User*, ECC Publications, 30-31 Islington Green, London N1 8BJ.

Overseas rates: Europe £18, Outside Europe £24 (including air-mail postage) Cheques should be made payable to EEC Publications.

Subscription Order Form

I wish to start a subscription to *Sinclair User*. I understand that I may cancel my subscription at any time and you will refund the balance.

☐ I enclose a cheque for £9 for 12 issues (U.K. only — including postage).

☐ Please charge my credit card.

Card Name_____ No._____

Address _____

_____

Signed_____

Date_____

HILDERBAY LTD
Professional Software

SPECTRUM SOFTWARE now available!

Details from us.
48K Payroll £25 until 21 September

Tape recorder suitable for microcomputer use, aligned and tested on computer signals **£2.2 + £2 p&p.**

Hiderbay Loading Aid. Load your microcomputer from tape first time every time! **£5.95.**

ZX-81 16K RAM packs, comprehensively tested (for bad bits, addressing faults, printer, saving) £30.

HILDERBAY SUMMER ZX-81 SALE

Beamscan (beam analysis) **Payroll** **Stock Control**	**£13 each**
Optimax	**£20** until 21 September
Budget I & II	**£9** (2 programs)
Time Ledger **Critical Path**	**£8 each**
Financial Pack I **Gold**	**£5 each**

These programs have been described and reviewed previously (or we can prove details).

All prices include VAT, and are post free. Sale prices are valid until 21 September 1982. Free updates, comprehensive telephone and personal support, and competition prizes are not available for summer sale purchases.

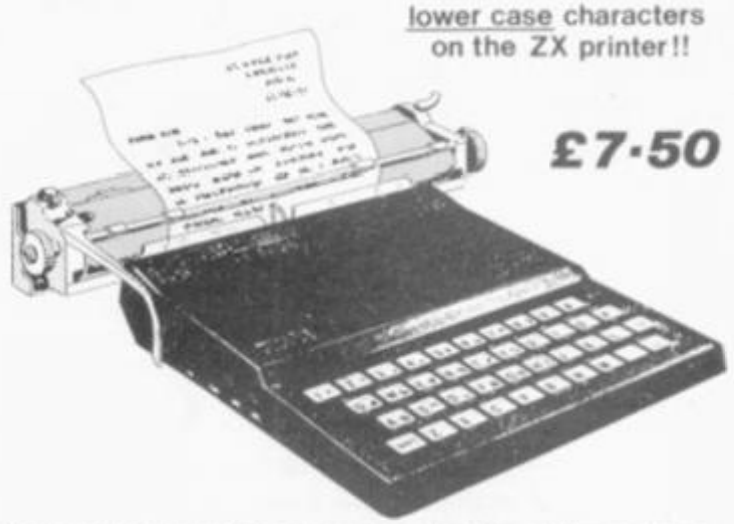
HILDERBAY LTD
Professional Software
8/10 Parkway
Regents Park
London NW1 7AA

***Tel:* 01-485 1059** ***Telex:* 22870**

LTEXT AND ZTEXT ZX81 WORD PROCESSORS

lower case characters on the ZX printer!!

£7·50



No longer need you be confined to space games, battleships and the like. With these programs your ZX81 becomes a viable commercial machine. ZTEXT (upper case characters only) and LTEXT (upper and lower case characters) are word processors which incorporate a text editor and a formatter/printer. The text editor allows you to type text in and edit it. The formatter/printer takes the text and sends it to be screen or ZX printer, justifying it and formatting according to commands embedded in the text. Included in the range of commands are such useful operations as string search, string replacement and a merge facility enabling a skeleton document to be filled with variable information. LTEXT caters for both upper and lower case characters. No, that is not a misprint. By utilising the high resolution graphics feature of the ZX printer Graham Asher has built a complete set of lower case characters. These program come complete with a detailed manual.

Send 95p (redeemable against first order) for full catalogue and FREE listing. Please state ZX81 on order.
All prices include VAT and P&P available from
Oasis Software, Lower North Street, Cheddar, Somerset.
Tel: Cheddar 743409
Dealer enquiries welcome

ACCESS ORDERS TAKEN BY PHONE 24 HOURS A DAY

OASIS SOFTWARE

ARTIC

MOVING AHEAD WITH ZX SOFTWARE

ZX CHESS & ADVENTURES

PROGRAMS FOR THE ZX81/80 INCLUDING –

NEW ZX-FORTH	Full implementation of FORTH for the ZX — 10 — 26 time faster than BASIC. 'Simplicity of BASIC with speed & machine code.'
16K RAM PACKS NEW £29.50	BYGBYTE RAM PACKS, no wobble problems. 1 year guarantee on each RAM PACK. The best you can buy. Immediate delivery.
1K ZX-CHESS!! NEW £2.95	We didn't think it was possible, but the game plays against you, two opening moves, only 1K of memory needed.
ZX CHESS I reduced to £6.50	Very popular machine code program, with six levels of play and an analysis option. Unbeaten except by:
ZX CHESS II now only £9.95	A new improved version with a faster response time, seven levels of play, and in addition a recommended move option.
ADVENTURES ADVENTURE 'A' £6.00	Exciting machine code games with instant response, choose from the range below. You find yourself stranded on an alien planet. Can you reach your ship and escape?
ADVENTURE 'B' £7.00	In a jungle clearing you come across an Inca temple. You must break in, collect treasure and escape alive. Beware. Includes a cassette save routine.
ADVENTURE 'C' £8.00	You are unfortunate enough to be drawn to an alien cruiser. Can you reach the control room and free yourself or will they get you first? Includes a cassette save routine.
GALAXIANS £3.95	All the features of the acarde game in a fast machine code program. Swooping attackers, explosions and personalised scoring.
ZX BUG £7.00	A 30 in 1 machine code tool and disassembler, allows access to all registers and to search through, and modify memory; with cassette routines.

and many more. For a catalogue giving full details, please send a S.A.E to

Artic Computing
Dept. EE
396 James Reckitt Avenue
Hull HU8 0JA.

Little switch into reverse

THE ZX-81 video invertor consists of one integrated circuit, which is an npn transistor array, seven resistors and one coupling capacitor, all contained on one small PCB — 20mm. by 32mm. — which probably is manufactured using a Photolac process. The idea behind the device is to reverse the conventional display to give white characters on a black background, a switch being provided to return to normal display mode.

The PCB is held in place by a strip of double-sided adhesive tape on top of the logic chip IC1, although that is only for location purposes. The device works by intercepting the signal to the modulator and installation requires the cutting of a wire to the modulator and soldering four wires in appropriate positions.

The toggle switch is fitted to the rear of the ZX-81 case and a ¼in. hole has to be drilled to accommodate it. Many Sinclair users may be justifiably reluctant to drill holes in their ZX-81s so it may be possible to locate the switch in a different way, or perhaps omit it completely and stay in inverse video mode.

The invertor costs £3.50 and is available from Dieter Fritsch, G5CKZ, 6 Stanton Road, Thelwall, Warrington, Cheshire WA4 2HS.

A similar device is available from B A Reader to the one just described but consists of a single IC and a rather over-sized toggle switch, both being mounted on a small piece of Veroboard. The manufacturer has indicated that a smaller switch is now supplied with the kits. Installation again consists of drilling a hole located on top of the ZX-81 case — although space immediately below the switch is very limited — and cutting a lead to the modulator.

This inverse video switch costs £3.75 built and £2.95 as a kit and is obtainable from B A Reader, 45 Alfred St, Kings Heath, Birmingham B14 7HG.

Fulcrum bleep

THE Fulcrum ZX-81 Bleep consists of a small PCB measuring 3±in. by 2in. which fits into the space inside the ZX-81 case, underneath the keyboard. That particular space is much favoured by other manufacturers for their add-ons, so it could be difficult to fit any other device there since the heat sink is close to it.

The sound, which is a short bleep, is made by a small transducer which is located in one corner of the PCB. Fulcrum emphasises that the device requires no soldering, the connections to the ZX-81 being two wires for power and a 5-way flexible cable which plugs into the existing keyboard tail socket.

The device works in both FAST and SLOW modes although it does not function on certain shifted keys.

Since the review was done the company has brought out the ZX-81 Keyboard Bleeper which covers all 210 characters.

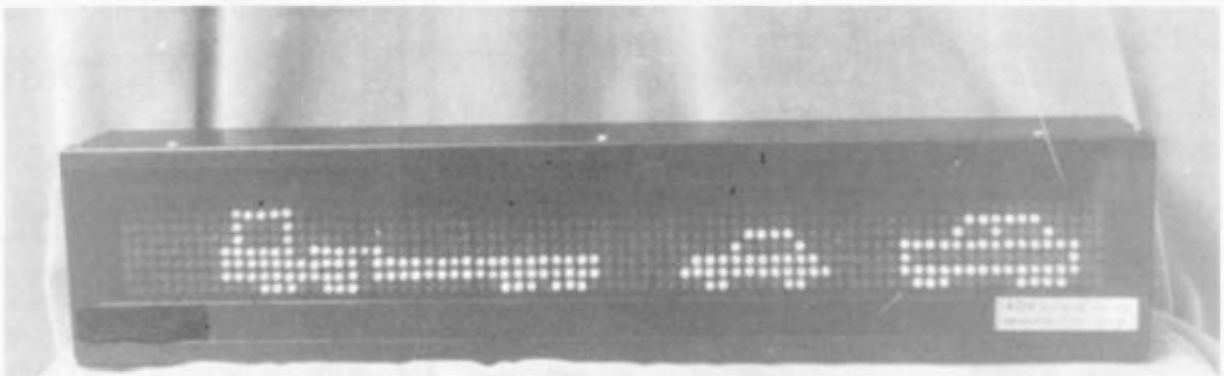
The ZX-81 Bleep and the ZX-81 Keyboard Bleeper are both priced at £8.95, including VAT and postage, and can be obtained from Fulcrum Products.

Colourscreen for tired eyes

ELLANBEE (Graphics) can provide a cure for tired eyes from too much staring at a bright TV screen. Colourscreen is a large, coloured, optically-clear plastic sheet which goes over the TV screen. It is a 15 × 12in. sheet which is cut to fit the size of your TV screen and then fitted carefully over it.

It requires no tape or other fixing and can be removed at any time. It is in two colours, blue or green, with instructions and a specially-stiffened storage envelope, at a cost

continued on page 44.



ADH display interface

Display interface

ADH SYSTEMS has prodced an interface which allows a ZX-81 to control a LED or filament lamp display for advertising in a shop window. The system can control a 16, 24, 40 or 80-column display and is not limited only to numbers or figures. The display is seven LEDs high and can

continued from page 43.

of £2.95. Larger sizes are available on request from Ellanbee (Graphics), 11 Lichfield Close, Great Lumley, Chester-le-Street, Co. Durham DH3 4QH. 0385-886967.

New supply of printer paper

PRINT-N-PLOT Products, which produces a display mapping book and foils, is now supplying printer paper for the Sinclair printer. Silicon Tricks is not now supplying paper, so this would seem the only alternative to Sinclair.

The quality is as good as, if not better, than that of Sinclair and at £10.95 is cheaper. Print-N-Plot is also selling a book on computer graphics at £1.50. All prices are inclusive of VAT and paper can be obtained from various ZX computer shops.

Memory chunks

EAST LONDON Robotics has produced a incremental RAM board which allows you to add up to 16K of static RAM in 2K portions to a ZX-81. The board fits inside the ZX-81 and can be used with any RAM pack available. It requires no soldering to fit the board and its instructions cover nearly every possibility.

The board uses 6616 static RAMs and can be addressed into any position in the memory map. The 8K incremental board costs £12.01 and the 16K £13.23. To that must be added the price of the RAM chips at £4.93 and 45 pence for postage if the order is less than £15. East London Robotics is at Finlandia House, 14 Darwell Close, East Ham, London E6 4BT.

Remote controller

STRIPELAND LTD has produced a computer interface for the ZX-81 which can control another device in another room without wires between the two. The mains wiring is used to transfer a signal from the micro to the remote control unit attached to an other device.

At the moment the computer can only send signals and not receive them via the system but modifications to produce a two-way device will be available soon.

The ZX-81 computer interface costs £61.40 and the remote control £27.50, inc. VAT and postage. Stripeland is at 111 Liverpool Road, Formby, Merseyside L37 6BR. 0704-878062.

IN the June edition we published the telephone number of Eprom Services, 3 Wedgewood Drive, Leeds as 0532-667188. This should have been 0532-667183.

ZX81

the BEST yet
from M.C. Associates

PELOPONNESIAN WARE

— a brand new 16K game

Your ultimate goal is a final victory over the Spartans but you will need to deploy all your skill in a combination of diplomacy and military force before you even stand a chance!

Price £5.95

also

TYRANT OF ATHENS Price £4.95
ROMAN EMPIRE Price £5.95

Buy more than one cassette and deduct 50p from the price of each.

Cheques or POs please — made payable to:
M.C. ASSOCIATES
4 GRANBY ROAD, CHEADLE HULME
CHESHIRE SK8 6LS

ZX81 16K

LOTHLORIEN
COMPUTER GAMES

New release "Warlord" £4.95
A16K game set in 13th Century Japan

- Can you rule a warring village to survive for 30 years?
- Can you defeat the armies and samurai of other warlords?
- A challenging game where all results are dictated by your own decision.

"SAMURAI WARRIOR"

Could you survive in 13th century Japan?

- In combat with other Samurai
- Fighting bandit groups
- Assisting villages

or will you commit ritual suicide?

Become engrossed in this game of skill

for only **£5.95**

Cheques or POs please, payable to:
LOTHLORIEN COMPUTER GAMES
94 Flixton Road, Urmston,
Manchester M31 34D

Philip Joy looks into his postbag and finds a wide variety of competition entries, new forms of chess and anagram games.

Good response to Nim contest

PMARSON, from Mansfield, Nottinghamshire has what look like two good programs, **HexaPawn** and **QuadraPawn**. He has included 10 pages of details about them but I have not had time to read them.

It makes a change, though, to see that amount of documentation; most people supply very few details. He asks a question about how much memory a program takes but I feel that it would be more useful for him to know how much memory is left, as he will then know how much free space he has, taking account of variables as well.

He will also know how much his program is taking up, variables and all, by taking away that figure from his memory size. I know of a USR routine in the ROM which will give the amount of free memory. The instructions look like this:

Print USRx.

What I want to know is x, its decimal value; the first person whose letter I open will be sent a copy of my adventure program. Please mark the letter USR competition.

I was delighted to receive a number of versions of both one- and three-pile **Nim**. I have decided to give copies of my adventure game to J Leaver, Bedford College, London; M Woodruff, Accrington, Lancs; H Duncan, Cambridge; J Williamson, West Lothian; I Stracey, Ely, Cambs. If they will send me a SAE with at least a C20, I will copy the adventure on to it for them.

If you send a tape to me and would like it returned, please enclose a SAE.

Some of the versions of Nim fit into 1K and one is listed, while others use machine code or show very high skill. So people have won a copy of my adventure for different reasons. The version listed is a winner, from Hugo Duncan, of Cambridge; it fits into 1K of memory.

Duncan says that the number of matches may be changed by changing line 1 and line 100. He says that if it is changed to a multiple of four, the ZX-81 is unbeatable.

Returning to chess, I thank Mr Egdoll of Glasgow for sending some more matches. I will be including those games but they take a long time to check and comment on ready for publishing.

I received a letter from the Electric Pencil Co of North Humberside about chess programs in general. I was asked to compare Chess I-ZX chess — to the Sargon chess program and Chess II to the TRS-80/VG Sargon 2.5 program. I have a Video Genie computer and a copy of the Sargon 2.5 program and I can say that if Chess II plays as well, it must be very powerful.

Two programs were received this month which are different from what has been included so far. They are **Anagram** and **Crossword** but were received too late for review this month. At first glance it looks as if they are good.

The address to send answers to problems, or about any other idea, is Philip Joy, 130 Rush Green Road, Romford, Essex, RM7 0QA.

```
1 LET X=VAL "50"
2 PRINT "NIM";TAB 1;"MAX.NO.OF MATCHES YOU MAY TAKE =3"
3 PAUSE 120
4 CLS
10 PRINT AT 0,0;"YOUR GO"
15 PRINT AT 11,5;"NO. OF MATCHES LEFT=";X;" "
20 INPUT A
25 IF A>3 OR A<1 THEN GOTO 20
30 LET X=X-A
35 PRINT AT 11,5;"NO. OF MATCHES LEFT=";X;" "
40 IF X=0 THEN PRINT AT 0,0;"YOU WIN";Q
45 PRINT AT 0,0;"  MY GO"
50 LET D=X
55 GOSUB 100
60 IF D=X THEN LET X=X-INT(RND * 3)-1
65 PAUSE 120
70 IF X=0 THEN PRINT AT 0,0;"I WIN  ";Q
75 GOTO 10
100 FOR H=0 TO 12
105 IF X-1=4*H THEN LET X=X-1
110 IF X-2=4*H THEN LET X=X-2
115 IF X-3=4*H THEN LET X=X-3
120 NEXT H
125 RETURN
```

MAKE THE MOST OF YOUR MICROCOMPUTER WITH OUR POPULAR RANGE OF PROVEN BOOKS:—

- ☐ **GETTING ACQUAINTED WITH YOUR ZX81**, by Tim Hartnell. Eighty plus programs in this 128-page book, including draughts. **£5.95**
- ☐ **20 SIMPLE ELECTRONIC PROJECTS FOR THE ZX81 and other computers** by Stephen Adams **£6.45**
- ☐ **MASTERING MACHINE CODE ON YOUR ZX81 OR ZX80**, by Toni Baker. 180 pages, teaches machine code from first principles. **£7.50**
- ☐ **49 EXPLOSIVE GAMES FOR THE ZX81**, edited by Tim Hartnell. **£5.95**
- ☐ **34 AMAZING GAMES FOR THE 1K ZX81** by Alastair Gourlay. **£4.95**
- ☐ **THE GATEWAY GUIDE TO THE ZX81 AND ZX80**, by Mark Charlton.Over 60 programs and routines, ZX BASIC explained in detail. **£6.45**
- ☐ **LEARN PASCAL ON ZX81 ZX SPECTRUM OR BBC MICRO-COMPUTER WITH 'PASCAL FOR HUMAN BEINGS'**, by Jeremy Ruston, which contains a 12K compiler so you can run a limited version of Pascal on your ZX81, ZX Spectrum or BBC Microcomputer. Book, plus compiler listing. **£4.95**
- ☐ **LET YOUR BBC MICRO TEACH YOU TO PROGRAM**, by Tim Hartnell, over 40 programs, BBC BASIC from first principles **£6.45**
- ☐ **THE BBC MICRO REVEALED**, by Jeremy Ruston. The full story on the BBC Microcomputer for the serious user. **£9.95**
- ☐ **GETTING ACQUAINTED WITH YOUR VIC 20**, by Tim Hartnell, with over 60 programs to get your VIC up and running from day one. **£6.95**
- ☐ **SYMPHONY FOR A MELANCHOLY COMPUTER** by Tim Hartnell. 24 great Vic games. **£6.95**
- ☐ **39 TESTED PROGRAMS FOR THE ACORN ATOM** Best of Interface edited by Tim Hartnell **£6.45**
- ☐ **GETTING ACQUAINTED WITH YOUR ACORN ATOM**, by Trevor Sharples and Tim Hartnell. 184 pages, 80 programs, including draughts. **£7.95**
- ☐ **INTERFACE**, the monthly magazine published by the **NATIONAL ZX USERS' CLUB** is just £9.50 (U.K.), £12.50 (Europe) for 12 issues. **Sample copy**, with many programs for your ZX computer, book, software and hardware reviews, education, contact addresses, just £1.

**All ZX81 books now contain Spectrum supplement, not available separately. All our ZX81 programs will run on your ZX Spectrum*

Please send me the items marked. I enclose £ .....

Name: .....

Address: .....

.....

.....

Please make cheques payable to **INTERFACE** and send the above form, or a copy, to: **INTERFACE, Dept. SC, 44-46 Earls Court Road, London W8 6EJ**

Please allow up to 28 days for delivery.

HAVEN HARDWARE

The World's largest range of ZX Hardware.

PROGRAMMABLE CHARACTER GENERATOR **KIT £17.95** **BUILT £24.95**
The FIRST and still the BEST. NO MOTHERBOARD or EDGE CONNECTOR required. Works DIRECTLY with ZX PRINTER and 16K MEMORY. HIGH-RES Graphplotter etc included.

FULL SIZE KEYBOARD with REPEAT KEY & SINGLE KEY RUBOUT etc
Specially designed for the ZX80 and ZX81. Still the only keyboard with all these features. **KIT £18.45** **BUILT £21.95**
(REPEAT KEY £1.45 extra, SINGLE KEY RUBOUT & CURSOR CONTROLS £1.45 extra)

REPEATING KEY MODULE **KIT £3.50** **BUILT £4.95**
UPGRADE YOUR ZX FULL-SIZE KEYBOARD TO OUR STANDARD or use this module with the standard keyboard.

SEE SINCLAIR USER MAY 1982.
****** TENS OF THOUSANDS OF SINCLAIR COMPUTERS ALREADY HAVE THIS FACILITY ******

INVERSE VIDEO MODULE (ZX81) **BUILT £5.95**
Thousands of Sinclair Owners have already seen how much clearer their display is in white on black. WHY NOT JOIN THEM?

ZX80 COLOURBOARD **KIT £39.95** **BUILT £49.95**
ANOTHER UNIQUE PRODUCT.
Define the colour of each character square from a choice of sixteen. Position on P.C.B. for mini-motherboard.

ZX EDGE CONNECTOR (GOLD PLATED) **£2.29**

ZX I/O PORT Interface your computer to the real world. **KIT £9.95** **BUILT £12.95**

ZX 3K MEMORY EXPANSION
Uses reliable STATIC RAM **KIT £11.95** **BUILT £13.95**
THE CHEAPEST SMALL MEMORY EXPANSION AVAILABLE ANYWHERE.

ZX SPECTRUM EDGE CONNECTOR **£2.95**

ZX SOLITAIRE CASSETTE All cassettes are tested before dispatch **£4.95**

OTHER PRODUCTS: Motherboard, Numeric Keypad, Bleeper, Single Key Entry Module.

SAE for DETAILS SHEETS, COMPONENT PRICES & ORDER FORM.

HAVEN HARDWARE, Dept 32, 4 ASBY ROAD, ASBY, LAMPLUGH, CUMBRIA CA14 4RR.

ZX SPECTRUM ZX81 ZX SPECTRUM ZX 81 ZX SPECTRUM ZX81

GAMES

These are the best value for money games available. Don't be fooled by the low prices — these are top quality games for use on either the ZX81 16K or the ZX SPECTRUM 48K.

(1)	**SUPERMIND:**	An enhanced version of Mastermind
(2)	**QUEST:**	As reviewed by SINCLAIR USER May 1982. Battle with the monsters in real time and collect treasures! Fast reactions essential!
(3)	**REVERSE:**	Arrange a series of digits in ascending order.
(4)	**STAR TREK:**	The classic game! All the usual features: 8 × 8 galaxies, photon torpedoes, phasers, Klingons, etc — a really good game!

CASSETTE A (ZX81 16K) contains games 1,2,3 and 4 — ONLY £5.95
CASSETTE B (ZX SPECTRUM 48K) contains games 1,2,3 and 4 — ONLY £6.95

State Cassette A or B when ordering.
Post and packing included.
Orders to:

SERIOUS SOFTWARE, 7 WOODSIDE ROAD, BICKLEY, KENT, BR1 2ES

ZX SPECTRUM ZX81 ZX SPECTRUM ZX81 ZX SPECTRUM ZX81

Andrew Hewson.

File problems on display in ZX-81

YOUR LETTERS are arriving thick and fast and I am having difficulty keeping pace with them. I make a conscientious effort either to answer letters individually, via this column or by referring to other answers in the column or elsewhere.

All the questions this month concern the ZX-81 display file in one form or another. Before tackling the first, let me review some fundamental ideas. The display file is the area in RAM which holds the items which are currently displayed on the TV screen. During the program development, for example, part of the program listing is generally displayed and it is the job of the LIST routine to copy the appropriate part of the program area into the display file so that it appears on the TV screen.

The address of the beginning of the display file varies with the length of the program and so it is held in the D-FILE system variable and can be PRINTed by entering:
PRINT PEEK 16396 + 256 *
PEEK 16397

Similarly, the address of the end of the display is held in VARS — or more correctly is one less than the value in VARS — and can be PRINTed by entering:
PRINT PEEK 16400 + 256 *
PEEK 16401-1

Each line displayed on the screen is terminated by a byte containing decimal 118 and there is one more byte at the beginning of the file also containing 118. As there are 24 lines in the display, there are 25 bytes containing 118 and it is essential to the correct functioning of the display software that all 25 bytes are present. If one or more is absent the ZX-81 will almost certainly crash.

With an unexpanded ZX-81 the display file consists of those 25 bytes and no more unless a LIST, PRINT or PLOT command has been executed since the last CLS or RUN command. That is a device to keep the display file as small as possible, thereby saving valuable space in RAM. With a memory expansion pack of 4K or more the ZX-81 pads-out the display file with 32 bytes per line each containing zero — i.e., blanks. That mechanism creates an immediate problem for users without extra memory, as Michael Wordruff of Accrington has discovered, he writes: **"I am having problems with programs which POKE the display because my ZX-81 crashes every time. For instance**

```
5 LET Z = 1 + PEEK 16396 + 256 *
POKE 16397
10 POKE Z, 128
```

is a disaster. What is happening?"

Wordruff's routine is attempting to POKE an inverse space into the first PRINT position and it will work well on a ZX-81 with at least 4K of RAM because the display will be padded-out with 32 blanks per line. Without the extra memory, no such padding occurs and so the routine will over-write the second of the 25 bytes containing 118, thus causing the program to crash.

The solution to the problem and to all similar ones is to create some space at the appropriate position in the display file by PRINTing one or more blank characters. In that case one space is required at the beginning of the first line and so the answer is to add the line:
2 PRINT "b"
where b represents the space character.

"I would like to give a print instruction conditional on whether or not there is anything already printed at the same position. I solved the corresponding problem by using PEEK 16438 and PEEK 16439 but the use of PEEK 16441 and PEEK 16442 does not work. Can you help?" asks Brian O'Donnell of Notting Hill, London.

Page 179 of the ZX-81 Basic Programming Manual shows that addresses 16438 and 16439 in the system variables area hold the x and y co-ordinates of the last point to be PLOTed, as O'Donnell has discovered. Unfortunately the equivalent information for PRINT is not stored. Instead the position at which the next item will be PRINTed is held in 16441 and 16442. There is a further complication; the horizontal PRINT position is counted from right

continued on page 48

continued from page 47

to left and the vertical position from the bottom upwards. Thus the routine

```
10  PRINT "HELP-LINE"
20  LET A = PEEK 16441
30  LET B = PEEK 16442
40 PRINT A, B
```

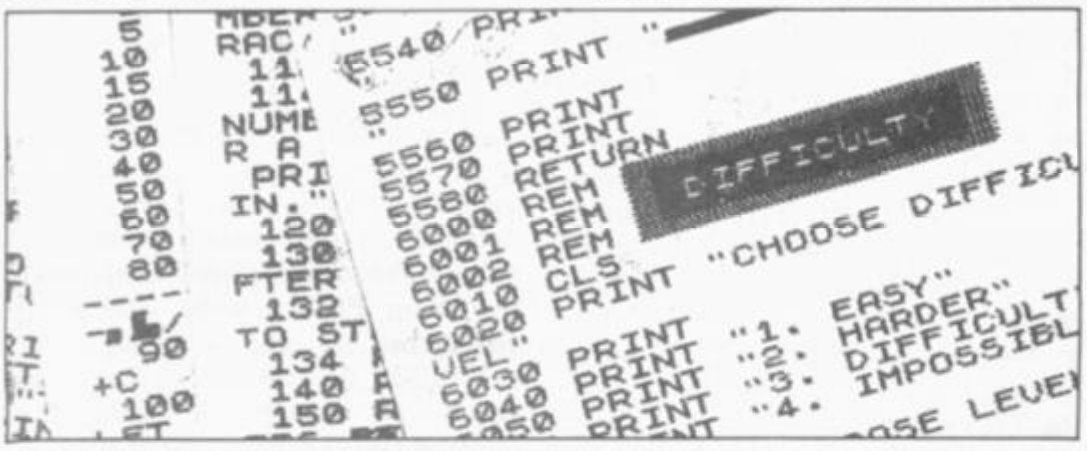
will print the values 33 23. The first value, 33, indicates that the PRINT position is at the beginning of a line, i.e., 33 characters counting from right to left from the beginning of of the subsequent line. The second value, 23, indicates that the line is the 23rd from the bottom of the screen because one line has been used to PRINT "HELP-LINE". If line 10 is changed to

```
10  PRINT "HELP-LINE";
```

the values PRINTed are 24 24, because the semi-colon prevents skipping to the next line.

The following rather artificial program PRINTs a new character over the top of the last character PRINTed:

```
10  PRINT AT 20,0; "ENTER
    VALUES FOR """PRINT AT""""
20  INPUT A
30  INPUT B
```




```
40  PRINT AT 20,0; "ENTER A
    CHARACTER TO PRINT"
50  INPUT Z$
60  PRINT AT A,B;Z$;
70  LET B = 32 - PEEK 16441
80  LET A = 24 - PEEK 16442
90  GOTO 40
```

The semi-colon at the end of line 60 is vital. If it is omitted the information as to the position along the line cannot be recovered from 16441.

Ken Hustwitt of Royston, Hertfordshire is worried about any adverse effects his ZX-81 might have on his TV. He writes: **"I note that my TV insurance cover contains a clause excluding damage caused by the use of TV games. Can you advise if my ZX-81 can damage my set?"**

Television screens are designed to reproduce as faithfully as possible a picture of varying intensity. The ZX-81 produces a more or less static image of uniform intensity. The only way in which damage is likely to occur is if you leave the same image on the screen for a long period with the brightness and/or contrast turned up.

In this situation it is possible that the brightest parts of the image become burned into the screen, although with the normal black-on-white display your eyes are likely to feel uncomfortable long before the screen shows any ill-effects; hence while it is possible that the ZX-81 may damage the screen, damage is very unlikely if you keep the brightness and contrast at reasonable levels.

"I would like to know if all the 16K RAM packs on the market memory map the video screen", writes Neil Davies of Cannock, Staffs. The answer is yes; all 16K RAMs work in the same fashion so far as the user is concerned. The area between the D-File and VARS addresses is mapped to the TV screen.

The most interesting letter this month is from Michael Sims of Dundee. I wrote in a previous column that it is not possible to have a Basic program longer than about 15K, even if more than 16K of RAM is available, because the display file will not function correctly above address 32767 and the ZX-81 will

crash. Not so, writes Sims.

"No crash occurs if the display file is entirely below 32767 or entirely above 32768 but a crash will occur if the display file straddles the two addresses and is then displayed.

"The cure is simply to ensure that when the display file nears 32767 — check the VARS system variable — you enter a huge line like:

XXXX LET ZERO = 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + ...

"With about 100 repetitions of + 0 such a line takes up more memory than the display file when in the program area but lists in less. When NEWLINE is pressed display ceases while room is made below the display for the program line to be inserted, pushing the display file entirely above 32768 before display resumes."

I tried it and it worked. In case I was the only ZX-81 user who did not know the trick, I contacted Bob Branton, the software expert at Memotech Ltd, which manufactures a 64K RAM for the ZX-81. It was news to him, too, which made me feel better. In fact, Branton was so pleased with the idea that he has sent the new Memotech high-resolution graphics pack to Sims to thank him for a neat idea.

The reason Sims' "huge line" takes so much space in the program area is because each 0 is followed by six hidden bytes, the first one containing 126 and the remainder holding the numerical representation of zero. I have described the arrangement in previous columns. The six hidden bytes are omitted from program LISTings.

© Hewson Consultants 1982.

● *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

THE ZX BOOK CLUB

DUE SEPTEMBER 1982

written by the man who helped write the documentation for the ZX Spectrum:-

LEARNING TO USE THE ZX SPECTRUM COMPUTER

only **£5.95**

by Robin Bradbeer. 100 pages fully illustrated.

This book has been written specially to help new and prospective owners of the ZX Spectrum to easily understand the operation and full capabilities of this amazing new microcomputer.

* *Provides clear descriptions of the hardware and functions, describing use of the new keyboard, command keys and editing facilities.*
* *Explains simple programming using Sinclair BASIC.*
* *Describes graphics and colour facilities in detail.*
* *Includes many programs, including animation.*
* *Appendices cover technical details and a glossary.*

ALSO DUE SEPTEMBER 1982 – and also by Robin Bradbeer:–

LEARNING TO USE THE ZX81 COMPUTER

only **£5.95**

by Robin Bradbeer. 100 pages fully illustrated.

In the same series as the Learning to Use the ZX Spectrum, this new book follows the same format, style and content and will prove an invaluable guide for new (and experienced!) ZX81 owners.

Other bestselling titles:–

Byteing Deeper into Your ZX81 by Mark Harrison
20 Simple Electronic Projects for the ZX81 by Stephen Adams
Mastering Machine Code on your ZX81 by Toni Baker
The ZX81 Pocket Book by Trevor Toms

READ-OUT PUBLISHING COMPANY LTD
8 Camp Road, Farnborough, Hampshire, GU24 6EW Telephone: 0252 510331/2 Telex 858001 GOWER G

READ-OUT PUBLISHING COMPANY LTD

8 CAMP ROAD, FARNBOROUGH, HAMPSHIRE GU24 6EW.
24 hour answering service. Telephone: 0252 510331/2

Name _____

Address _____

_____

Make cheques payable to Read-Out Publishing Company Ltd.

I enclose my cheque for £.....

Please debit my Access ☐

Number ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Signed _____

Date _____

☐ Please reserve my copy/ies of
☐ Learning to Use the ZX Spectrum @ £5.95
☐ Learning to Use the ZX81 @ £5.95

☐ Please send me _____ copy/ies of
☐ Byteing Deeper into Your ZX81 @ £6.45
☐ 20 Simple Electronic Projects for the ZX81 @ £7.45
☐ Mastering Machine Code on Your ZX81 @ £8.50
☐ The ZX81 Pocket Book @ £6.95

SU2

Disneytime cartoons come to the land of the little Sinclair

Jack Knight considers that if it were not for the moving characters, micros would lose much of their fascination

IF IT were not for the graphics I would not be as fascinated by microcomputers as I am. Moving characters and objects around the screen and making them work is challenging with only 1K of memory and without resort to the complications of machine code.

The first thing to prove is that objects can be moved any way around the screen. What is needed is something simple but realistic, something which is in its element whichever way it travels in space. An aircraft? No, speeding backwards it would hardly be credible. So a helicopter. To see what it looks like type-in the following and RUN. The loop will be needed shortly and we want its character co-ordinates to look at the graphic.

In all that follows, unless it is stated, the Vs stand for spaces.

```
10 FOR L=0 TO 26
20 PRINT AT 5,L;"----";TAB L;
"U "
```

RUN. Simple, easy to play with, but with a passing resemblance to

© 1982 WALT DISNEY PRODUCTIONS

what is intended. Before you rush in with the NEXT statement, be prepared for a program short of perfection, but RUN it as it is, as there is a purpose. First:

30 NEXT L
RUN

It is a case of "tear along the dotted line". My intention was to emphasise the need for an eraser, a space or spaces to rub out the character(s) left behind as the graphic moves along. Edit line 20 by inserting a space after the first inverted commas. That is the eraser but you have not finished yet. There is a need to include another space at the beginning of the second part of the graphic, otherwise the helicopter will be lopsided. RUN.

The difficulty you have had editing a line you have only just typed-in will be worthwhile as a reminder for the future of how essential the eraser is.

Another thing to remember from the program is the TAB statement. It caused the body of the helicopter to be printed on the next line. The rule is that PRINT stays on the same line unless that would involve backspacing, when it moves to the next line.

So what about bringing the helicopter back across the screen? Delete line 10 and replace it by:

10 FOR L = 26 TO 0 STEP -1

The eraser? With line 20 a space is needed at the end of each of the two parts of the graphic. RUN.

To make the aircraft move up the screen, first replace line 10 by:

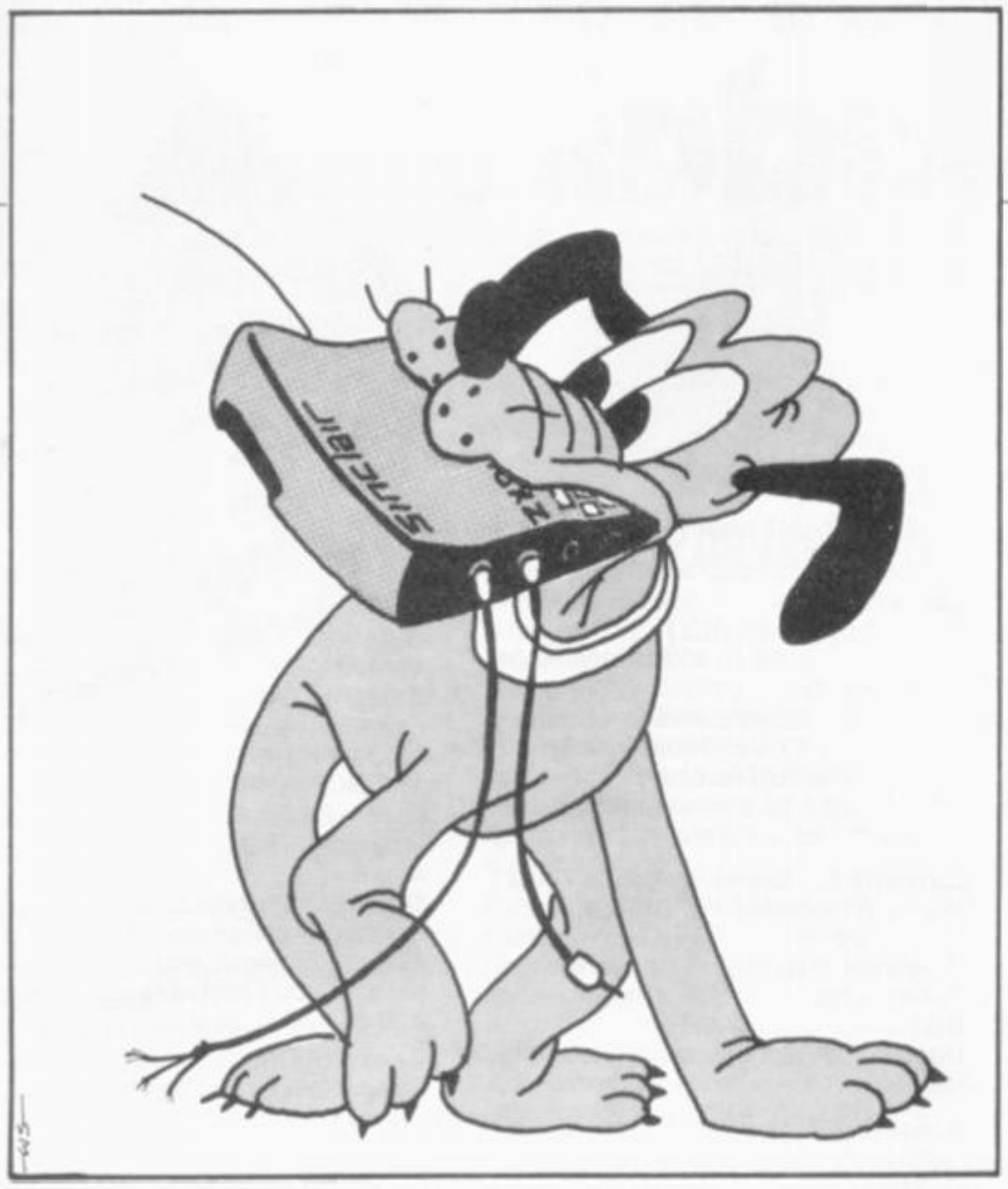
10 FOR L = 19 TO 0 STEP -1

Then change line 20 to:

```
20 PRINT AT L,13;"----";TAB 1
3;"U U";TAB 15;"(5 SPACES)"
```

RUN

That is the least successful



direction to move a graphic, for technical reasons. Before leaving this program, notice the string of erasers inserted to clean-up after the graphic.

To complete movement in the four main directions, the helicopter needs to be brought down the screen. Replace lines 10 and 20 by:

```
10 FOR L=0 TO 19
20 PRINT AT L,13;"(6 SPACES)";
TAB 13;"---=---";TAB 13;"U "
```

RUN

It has probably already occurred to some that it should be possible to fly the machine around the back of the screen. So add:

```
40 CLS
50 FOR L=1 TO 50
60 NEXT L
70 RUN
```

RUN

The PAUSE statement could have been used instead of lines 50 and 60 but an empty loop has the advantage that it is free of the irritating flash. The count from 1 to 50 is approximately one second — the same number of screens per second on British TV.

We have not finished yet. It is also possible to move an image diagonally up or down the screen in either direction. Staying with our patient helicopter, we will try one of the more difficult — that is from the top right corner to the bottom left; it is difficult because character coordinates must be used with the one increasing and the other decreasing. Type-in:

```
20 PRINT AT L,19-L;"(6 SPACES)
";TAB 19-L;"---=---";TAB 19-L;"U
"
```

RUN

Notice that once you know how, it is easy to handle increasing and decreasing numbers at the same time (L and 19-L).

Before we leave the helicopter let it show us its profile, hovering, rotars turning. Alter the last part of the graphics of line 20 and type-in new lines as follows:-

```
20 PRINT AT L,19-L;"      ";TA
B 19-L;"---=---";TAB 19-L;"=(
30 FOR M=1 TO 100
40 PRINT AT 1,19;"--";TAB 22;"
UU"
50 PRINT AT 1,19;"UU";TAB 22;"
--"
60 NEXT M
```

RUN

Finally, having experimented to lay the groundwork, that is the moment to run an animated cartoon, but do not expect a full-length feature — remember it is only a 1K RAM. Perhaps, however, it will set you on the way to designing your own graphics.

Before you RUN the cartoon, here are some hints, as you will be hard up against the limit of the memory. Operate NEW before you start, to clear everything first. If you need to EDIT and the ZX will not bring down the line, CLEAR and then operate EDIT immediately. If the graphics do not look correct, go over the variables, check the number of spaces and the characters to shake out the bugs.

```
 10 PRINT AT 5,5;"BOOMERANG"
 20 PAUSE 75
 30 LET A$="UUUU          "
 40 FOR L=0 TO 10
 50 PRINT AT 15,L;A$;TAB L;"UU
          ";TAB L;"U          "
 60 NEXT L
 70 PAUSE 50
 80 FOR L=20 TO 30
 90 PRINT AT 15,L;"U "
100 NEXT L
110 PRINT AT 15,31;"U"
120 FOR L=1 TO 18
130 PRINT AT 16,L;"U "
140 NEXT L
150 PRINT AT 16,19;"U"
160 PAUSE 50
170 PRINT AT 15,14;"(6 SPACES)"
;TAB 10;A$
180 PAUSE 50
190 PRINT AT 16,19;"U";TAB 19;"
"
200 PAUSE 100
210 PRINT AT 10,12;"THE END"
```

New ZX81 Software from Sinclair.

A whole new range of software for the Sinclair ZX81 Personal Computer is now available – direct from Sinclair. Produced by ICL and Psion, these really excellent cassettes cover games, education, and business/household management.

Some of the more elaborate programs can only be run on a ZX81 augmented by the ZX 16K RAM pack. (The description of each cassette makes it clear what hardware is required.) The RAM pack provides 16-times more memory in one complete module, and simply plugs into the rear of a ZX81. And the price has just been dramatically reduced to only £29.95.

The Sinclair ZX Printer offer full alphanumerics and highly-sophisticated graphics. A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. So now you can print out your results for a permanent record. The ZX Printer plugs into the rear of your ZX81, and you can connect a RAM pack as well.

Games

Cassette G1: Super Programs 1 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Invasion from Jupiter. Skittles. Magic Square. Doodle. Kim. Liquid Capacity.
Description – Five games programs plus easy conversion between pints/gallons and litres.

Cassette G2: Super Programs 2 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Rings around Saturn. Secret Code. Mindboggling. Silhouette. Memory Test. Metric conversion.
Description – Five games plus easy conversion between inches/feet/yards and centimetres/metres.

Cassette G3: Super Programs 3 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Train Race. Challenge. Secret Message. Mind that Meteor. Character Doodle. Currency Conversion.
Description – Fives games plus currency conversion at will – for example, dollars to pounds.

Cassette G4: Super Programs 4 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Down Under. Submarines. Doodling with Graphics. The Invisible Invader. Reaction. Petrol.
Description – Five games plus easy conversion between miles per gallon and European fuel consumption figures.

Cassette G5: Super Programs 5 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Martian Knock Out. Graffiti. Find the Mate. Labyrinth. Drop a Brick. Continental.
Description – Five games plus easy conversion between English and continental dress sizes.

Cassette G6: Super Programs 6 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Galactic Invasion, Journey into Danger. Create. Nine Hole Golf. Solitaire. Daylight Robbery.
Description – Six games making full use of the ZX81's moving graphics capability.

Cassette G7: Super Programs 7 (ICL)
Hardware required – ZX81.
Price: – £4.95.
Programs – Racetrack. Chase. NIM. Tower of Hanoi. Docking the Spaceship. Golf.
Description – Six games including the fascinating Tower of Hanoi problem.

Cassette G8: Super Programs 8 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Star Trail (plus blank tape on side 2).
Description – Can you, as Captain Church of the UK spaceship Endeavour, rid the galaxy of the Klingon menace?

Cassette G9: Biorhythms (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – What are Biorhythms? Your Biohythms.
Description – When will you be at your peak (and trough) physically, emotionally, and intellectually?

Cassette G10: Backgammon (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £5.95.
Programs – Backgammon. Dice.
Description – A great program, using fast and efficient machine code, with graphics board, rolling dice, and doubling dice. The dice program can be used for any dice game.

Cassette G11: Chess (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Chess. Chess Clock.
Description – Fast, efficient machine code, a graphic display of the board and pieces, plus six levels of ability, combine to make this one of the best chess programs available. The Chess Clock program can be used at any time.

Cassette G12: Fantasy Games (Psion)
Hardware required – ZX81 (or ZX80 with 8K BASIC ROM) + 16K RAM.
Price – £4.75.
Programs – Perilous Swamp. Sorcerer's Island.
Description – Perilous Swamp: rescue a beautiful princess from the evil wizard. Sorcerer's Island: you're marooned. To escape, you'll probably need the help of the Grand Sorcerer.

Cassette G13: Space Raiders and Bomber (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £3.95.
Programs – Space Raiders. Bomber.
Description – Space Raiders is the ZX81 version of the popular pub game. Bomber: destroy a city before you hit a sky-scraper.

Cassette G14: Flight Simulation (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £5.95.
Program – Flight Simulation (plus blank tape on side 2).
Description – Simulates a highly manoeuvrable light aircraft with full controls, instrumentation, a view through the cockpit window, and navigational aids. Happy landings!

Education

Cassette E1: Fun to Learn series – English Literature 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Novelists. Authors.
Description – Who wrote 'Robinson Crusoe'? Which novelist do you associate with Father Brown?

Cassette E2: Fun to Learn series – English Literature 2 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Poets, Playwrights. Modern Authors.
Description – Who wrote 'Song of the Shirt'? Which playwright also played cricket for England?

Cassette E3: Fun to Learn series – Geography 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Towns in England and Wales. Countries and Capitals of Europe.
Description – The computer shows you a map and a list of towns. You locate the towns correctly. Or the computer challenges you to name a pinpointed location.

Cassette E4: Fun to Learn series – History 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Events in British History. British Monarchs.
Description – From 1066 to 1981, find out when important events occurred. Recognise monarchs in an identity parade.

Cassette E5: Fun to Learn series – Mathematics 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Addition/Subtraction. Multiplication/Division.
Description – Questions and answers on basic mathematics at different levels of difficulty.

Cassette E6: Fun to Learn series – Music 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Composers. Musicians.
Description – Which instrument does James Galway play? Who composed 'Peter Grimes'?

Cassette E7: Fun to Learn series – Inventions 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Inventions before 1850. Inventions since 1850.
Description – Who invented television? What was the 'dangerous Lucifer'?

Cassette E8: Fun to Learn series – Spelling 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Series A1-A15. Series B1-B15.
Description – Listen to the word spoken on your tape recorder, then spell it out on your ZX81. 300 words in total suitable for 6-11 year olds.

Business/household

Cassette B1: The Collector's Pack (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £9.95.
Program – Collector's Pack, plus blank tape or side 2 for program/data storage.
Description – This comprehensive program should allow collectors (of stamps, coins etc.) to hold up to 400 records of up to 6 different items on one cassette. Keep your records up to date and sorted into order.

Cassette B2: The Club Record Controller (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £9.95.
Program – Club Record Controller plus blank tape on side 2 for program/data storage.
Description – Enables clubs to hold records of up to 100 members on one cassette. Allows for names, addresses, 'phone numbers plus five lots of additional information – eg type of membership.

Cassette B3: VU-CALC (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £7.95.
Program – VU-CALC.
Description – Turns your ZX81 into an immensely powerful analysis chart. VU-CALC constructs, generates and calculates large tables for applications such as financial analysis, budget sheets, and projections. Complete with full instructions.

Cassette B4: VU-FILE (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £7.95.
Programs – VU-FILE. Examples.
Description – A general-purpose information storage and retrieval program with emphasis on user-friendliness and visual display. Use it to catalogue your collection, maintain records or club memberships, keep track of your accounts, or as a telephone directory.

How to order

Simply use the FREEPOST order form below and either enclose a cheque or give us your credit card number. Credit card holders can order by phone – simply call Camberley (0276) 66104 or 21282 during office hours. Either way, please allow up to 28 days for delivery, and there's a 14-day money-back option, of course.

sinclair
ZX81
SOFTWARE

Sinclair Research Ltd,
Stanhope Road, Camberley, Surrey, GU15 3PS.
Tel: Camberley (0276) 66104 & 21282.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR.
Please send me the items I have indicated below.

Qty	Cassette	Code	Item price	Total
	G1: Super Programs 1	30	£4.95	
	G2: Super Programs 2	31	£4.95	
	G3: Super Programs 3	32	£4.95	
	G4: Super Programs 4	33	£4.95	
	G5: Super Programs 5	34	£4.95	
	G6: Super Programs 6	35	£4.95	
	G7: Super Programs 7	36	£4.95	
	G8: Super Programs 8	37	£4.95	
	G9: Biorhythms	38	£6.95	
	G10: Backgammon	39	£5.95	
	G11: Chess	40	£6.95	
	G12: Fantasy Games	41	£4.75	
	G13: Space Raiders & Bomber	42	£3.95	
	G14: Flight Simulation	43	£5.95	
	E1: English Literature 1	44	£6.95	

Qty	Cassette	Code	Item price	Total
	E2: English Literature 2	45	£6.95	
	E3: Geography 1	46	£6.95	
	E4: History 1	47	£6.95	
	E5: Mathematics 1	48	£6.95	
	E6: Music 1	49	£6.95	
	E7: Inventions 1	50	£6.95	
	E8: Spelling 1	51	£6.95	
	B1: Collector's Pack	52	£9.95	
	B2: Club Record Controller	53	£9.95	
	B3: VU-CALC	54	£7.95	
	B4: VU-FILE	55	£7.95	
	ZX 16K RAM pack	18	£29.95	
	ZX Printer	27	£59.95	
	Post & packing – *only if ordering hardware*		£2.95	

TOTAL £ ____

I enclose a cheque/postal order to Sinclair Research Ltd for £ ____

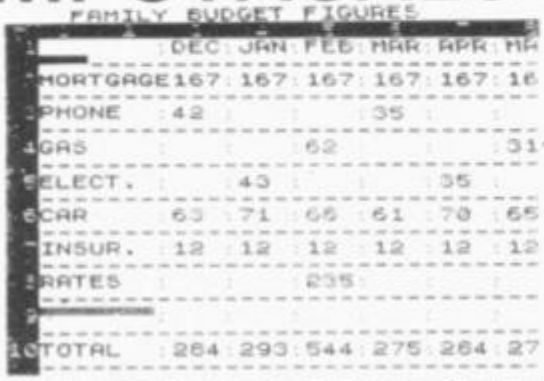
Please charge my *Access/Barclaycard/Trustcard no.
Please delete as applicable.

Mr/Mrs/Miss

Address

NSA 13

COMPUTACALC ZX


FAMILY BUDGET FIGURES
DEC JAN FEB MAR APR MA
MORTGAGE 167 167 167 167 167 16
PHONE 42 35
GAS 62 31
ELECT. 43 35
CAR 63 71 65 61 70 65
INSUR. 12 12 12 12 12 12
RATES 235
TOTAL 264 293 544 275 264 27

An advanced spreadsheet program for the Sinclair ZX81 with 16K RAM.

This versatile software allows manipulation and inspection of data in the most convenient way ever. Ideal for financial planning, personal budgeting, cashflow analysis and countless other business, home, scientific and technical applications.

The screen acts as a window on a much larger grid (up to 38 × 38) of titles and numbers (up to 9 digits). Change one number or formula and all dependant results change automatically. Save on tape or printout for a permanent record.

Tasks that would take hours with pencil, paper and calculator can be performed in seconds with COMPUTACALC ZX.

Cassette and booklet — £7.95. Available from W.H. Smith, Better Computer shops and mail order from SILICON TRICKS, Dept S7 2-4 Chichester Rents, London WC2 1EJ. (Tel: 01-603 6074)

Silicon Tricks

NOW AVAILABLE **SPECTRACALC** for Spectrum 16K & 48K — All features of computacalc ZX and more — **£12.95** mail order only.

MICROWARE

MICROWARE MICROWARE

Retail Shop In LEICESTER for SINCLAIR Computers

Keyboards/Ram Packs, 1/0 Ports, Monitors, G/Roms; Games, Serious, Home/Business, Education Programs; Books & Magazines.

Also — Now stocking Books and Software for SPECTRUM, BBC and VIC 20.

MICROWARE

131 Melton Road
Leicester
Tel: 0533 681812

Closed Thursday
Open 9.30 5.30

MICROWARE

ZX81 & 16K
THE TOMB OF DRACULA!

3D HORROR ADVENTURE GAME!

Occupying over 13½K of memory, a superb 3D graphics adventure game for the ZX81 with 16K RAM, **for only £3.95!** **Enter** Dracula's tomb at 30 minutes to sunset . . . **wander** through the tomb's pre-mapped 300 vaults in search of the fabled Vampire's Treasure . . . **pick up** valuable silver stakes and use them to defend yourself against the lurking horrors . . . ghouls, zombies, pits of primaeval slime . . . **See** them all on the ZX81's plan of the tomb . . . when it will let you! **Take** a chance on a Mystery Vault . . . if you dare! And all the time the minutes are ticking by to sunset . . . when **Dracula** rises from his coffin and comes after **you**! Each of the infinite levels of the tomb has its own 300 vaults . . . go as deep as you like, the Prince of Darkness will seek you out in his blood-lust! **WARNING**: people of an exceptionally nervous disposition should play this game only during the hours of daylight! Special facility enables a game in progress to be saved on tape so you can continue it whenever you choose.

Price of only **£3.95** includes ready-to-load cassette with library case and inlay, full instructions, postage and packing. Order today! Money refunded if not delighted! Send cash, P.O. or cheque to:

MOVIEDROME VIDEO (Dept SU3),
19 Leighton Avenue, Pinner, HA5 3BW.

NEW BOOK

ZX81 USER'S HANDBOOK
Trevor J Terrell and Robert J Simpson

ZX81 owners wishing to learn more about their computer will want this book. It answers many questions about BASIC and machine code programming, and it explains the ZX81 hardware and how it operates. Programs in BASIC and machine code are included, to illustrate many of the points covered in the text and to help readers develop their own programs.

0 408 01223 4 144 pages approx £4.95 approx

ALSO OF INTEREST

ZX81 BASIC BOOK **Robin Norman**

Covers the basic 1K version, the additional facilities offered by the 16K expansion RAM and how to use the Sinclair ZX Printer. There are 14 original programs for you to run on the machine (for 1K and 16K versions), and for those confused by computer jargon (and who isn't?) there is a glossary of technical terms. Robin Norman assumes no initial knowledge of computing and his undemanding writing style is perfect for a beginner's introduction.

0 408 01178 5 176 pages £4.95

ORDER NOW from your local bookseller. In case of difficulty this advertisement can be returned to Patricia Davies at the address below. Please send me _____ copy/ies as marked. I enclose a cheque/PO for £_____ in total payment.

From _____
Address _____

Newnes Technical Books
a division of Butterworths, Borough Green, Sevenoaks, Kent TN15 8PH

(SU 8/82)

Claudia Cooke talks to Rick Dickinson, Sinclair industrial designer, who won a Design Council award for the ZX-81.

Modest award-winner sets the pace in micro design

AWARD-WINNING industrial designer Rick Dickinson is modest about his achievements, which so far include the ZX-81, for which he won a Design Council award, and the Spectrum.

"I don't think I have ever been delighted with anything I have done", says this blond, 26-year-old prodigy. "There always seems to be room for improvement".

Dickinson is a meticulous worker and while both the ZX-81 and the Spectrum are selling beyond all expectations, he adds: "I would never let anything go to production unless I was happy with it".

Graduating from the Newcastle Polytechnic pioneering industrial design course, Dickinson and his classmates are equipped, theoretically, to design anything "from knives and forks to ocean tankers".

Dickinson produced items as diverse as a chain saw and a road tanker during his first year as a qualified industrial designer, which he spent freelancing in Wales.

He had already spent some time working for Clive Sinclair while he was studying for his degree and it was not long before he was absorbed as a full-time member of staff and the company's sole industrial designer. He is responsible for the appearance of Sinclair products down to the layout of the components inside and the pattern of information on the keyboards. His membrane keyboard for the ZX-81 was revolutionary and largely responsible for the low retail price of the product.

Dickinson has learned that price is the ultimate justification and on all his designs he has to bear in mind the cost factor as well as the straightforward appearance of any item.

The membrane keyboard was a

continued on page 56

continued from page 55

great success and Sinclair has had to cope with numerous pirate copies since its inception but, as with everything, it had its disadvantages. Its main disadvantage was its inability to register touch. To ensure you have a response it is necessary to look at the screen — there is no reassuring click when you touch each key.

For the Spectrum, Dickinson has returned to a raised keyboard but again he has produced a first by making it from rubber.

He says: "I like the Spectrum much more than the ZX-81. It was much quicker to design but much more complicated. It is a step up-market and I was really trying hard for a super-smart machine. It is not for quite the same amateur market".

The process of design is a long one. Normally it begins when Clive Sinclair outlines his idea to Dickinson, including his demands about size. "He will resolve in his own mind the specifications and he will always say how small it has to be. I think how can it be that small? Yet he is always right in the end and we produce something which seemed impossible to me in the beginning".

Armed with his brief, Dickinson then spends a few days with his sketchbook, exploring ideas, but he likes to begin work in three dimensions as quickly as possible and is soon modelling in Perspex or plasticine.

The next stage is to produce the finished model in Perspex but obviously it has no components inside — it is produced as a solid block.

That model is detailed, even down to the graphics which Dickinson has painted on. Layout of the interior follows, with the designer using all his powers of logic to ensure that each component is in the best possible place. Perhaps the most difficult part is the keyboard. Dickinson says: "We spent a great deal of time on that. It is the only interface between the user and the product and it has to be right. We were trying also to cram on more information than anyone had every done. I believe that form should follow function".

Design of the ZX-81 took about six months in all. The Spectrum was quicker but with all his major projects Dickinson also has to set aside time for add-ons to existing computers — the work is never finished. His main project now is the flat-tube TV, expected to be launched later this year.

His biggest problem with that is that Sinclair has already been working on it for some time. Normally he is briefed at the same time as the electronic engineers but this time the inside is already finished. It is also another first, which means Dickinson cannot research by looking at existing products in the field.

Rick Dickinson at work in his workshop.

"That is the most exciting thing with this company, you know; many products are the first of their type, so you are really in on something new".

Dickinson is content with his life at the moment in every way. At school he liked the sciences and the arts and his job ensures that he remains involved in both. He spent one year on a foundation course at art college at Grimsby before starting to read for his degree and feels the experience was invaluable. He is happy with his work at Sinclair. When he started almost three years ago the staff numbered five. Today it is 30 and the company is going from strength to strength, crushing the effects of the recession as it marches on.

"We all work very closely, very much as a team. Most of the information is in people's heads. There is no time to be formal and put it down on paper. It is a good atmosphere in which to work".

For this award-winning Yorkshireman, it abounds with opportunity, too. He has already entered the Spectrum for this year's Design Council awards and on his drawing board are the initial stages of the flat-tube TV — another first, and possibly another award.

'That is the exciting thing in this company; many products are the first of their type so you are in on something new.'

ZX81 M.C. 16K SOFTWARE

ZXC ARCADE PLUS PACK:

SLOT — A graphical simulation of a fruit machine. With Hold and Nudge features.
BREAKOUT + SUPER PROGRESSIVE BREAKOUT
DODGEMS — with increasing difficulty. Can you evade the computer cars and clear all the dots.
LIFE — On a maximum 64x48 screen grid
Send cheque, postal order for £7.95 to:

A. READMAN SOFTWARE,

16 South Row, Eldon, Biship Auckland, Co. Durham DL14 8UT
Mail order only, trade enquiries welcome

RENUMBERS THE PARTS OTHER PROGRAMS DON'T REACH

ZX81 RENUMBER-DELETE

Tucked safely away in high memory this fast M/C program really lives up to its name. Select either blocks, single lines or the whole program. Specify the START number, the NEW start number, the INCREMENT, and the STOP number, HIT the KEY and it's ALL DONE. By ALL we mean ALL GOTOS, GOSUBS, LIST, LLISTS, & RUNS which have branch addresses in the affected region. DELETE allows you to select LINES or BLOCKS and INSTANTLY remove them from the program. VERY FAST, no waiting, an extremely well written program. £6.00 including V.A.T. and POST.

ZX81 — TOOLKIT

Along with RENUMBER/DELETE, a further 3 utilities are included to make this a must for serious programmers. (1) FIRST REM EXPANDER. Expand the first REM by any specified length. Easy to use. Type 1 REM followed by any CHARACTER. Call the EXPANDER. SPECIFY the number of BYTES to add. A few BLINKS later and it's DONE. (2) DECIMAL REM LOADER. Use this to load DECIMAL CODE into the first REM. ALLOWS use of the existing line edit facilities. So easy to use. (3) 66 BYTE MEMORY LISTER. Start where you like. Specify the start address and immediately the contents and locations of 66 bytes will be DISPLAYED or PRINTED. One SINGLE KEYSTROKE will then page FORWARDS or BACKWARDS as you wish. Well written in M/code USEFUL AND FAST TOO!! £8.00 inclusive. If you're not convinced send £1.00 and we'll send the instructions. If you buy within 14 days you can deduct the £1.00.
WORK FORCE, 140 WILSDEN AVE,
LUTON, BEDS LU1 5HR.

ZX81 HEWSON CONSULTANTS ZX81

HINTS AND TIPS FOR THE ZX81 by Andrew Hewson £3.95

The most complete book at the price

"Good value and quite fascinating ... a very inexpensive way of widening months of programming experience" Your Computer Nov '81

80 pages explaining how to squeeze a computing giant out of a Sinclair print pot. Saving Space – vital reading for all ZX81 users.
Understanding the Display File – using the display file as memory, creating a part of the display, using tokens in PRINT statements. Converting ZX80 programs – explaining jumpily but comprehensively how to convert the hundreds of published ZX80 programs. Chaining programs – revealing techniques for passing data between programs, calling subroutines from cassette and establishing data files. Machine Code Programs – all you want to know about ZX80 machine language. Explaining how to write, load, edit and save machine code and how to debug your routines. Routines and programs are scattered liberally throughout the text and the final chapter consists of 12 useful, interesting entertaining programs such as LINE RENUMBER, BOUNCER, SHOOT, STATISTICS etc.

64K MEMOPACK

0 8K – "Same as 48 + 8K
8 16K "Can be switched out in 4K blocks to leave room for memory mapping and vacant addresses for graphics etc. ROMs etc. The contents of this area of RAM are unaffected by loading programs from cassette. Can be used to store machine code routine or to store data for use by more than one program.
16-32K "Same as 48 + 8K
32-64K "Same as 48 + 8K

£79.00

PUCKMAN *NEW!* £5.95

* All action display
* Scour the maze for food
* Dodge the ghosts who come to devour you
* Automatic option – the machine plays itself
* Full keyboard display
* Full instruction display
* Continuous scoring
* Beat the best score to date
* Super graphics when used with Quick Silva graphics board

PILOT ★ £5.95

★ NEW!

New and exciting. Pilot challenges you to take off, fly between beacons, then land whilst watching wind speed and dodging craggy mountains – either could lead to disaster! If you take the challenge, you may soon learn to fly solo – so detailed are the flying instructions. Coast along in Autopilot – just to gain confidence, then battle your way through 8 further modes, 6 different ways of trying to steer your plane safely back to base, increasing in difficulty, testing your skills. Good luck with your fight against the unpredictable elements!

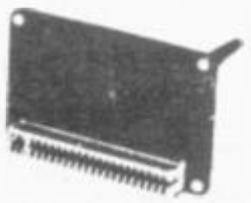
16K MEMORY

THE BEST VALUE FOR MONEY 16K RAM on the market. Coming complete with case, simply plugs into the port at the back of your Sinclair. Money back guarantee.

£26.95

48+8K NEW

0 8K "Same as 8K
8 16K "The contents of this area of RAM are unaffected by loading programs from cassette. Can be used to store machine code routine or to store data for use by more than one program.
16-32K "Basic program and display file.
32-64K "Variable and array area. Massive memory area for storage of data.
"Both addressable and user transparent.
"Facts sheet FREE with each RAM purchased.



£61.95

PROGRAMMERS TOOLKIT £6.50

"The Programmer's Friend and Friend" Are you writing your own programs for the ZX81? How can you do that without our Toolkit? It will encourage you to go on to write bigger, better and more sophisticated programs by doing your donkey work.

Simply create 3K of space above Ram top and then load the Toolkit in the normal way. The Toolkit hides above the Ram top awaiting your command. You can now load existing programs from cassette for the Toolkit to operate on. Or type in a whole new program!

Toolkit functions include:
* RENUMBER including the destination lines of GOTO's and GOSUB's, START and F inal lines and Step size specified by you.
* DELETE part or all of a program at your command.
* REPLACE (Program variable or token) with an equal number of others specified by you.
* EDIT to create sub-routines at a stroke by moving blocks of basic program lines.
* FIND a basic program string specified by you.
* INPUT prompts for a two digit hexadecimal code and pokes it in at a specified address.
* Separate version available for 48 + 8 and 64K memories. Handles all BASIC.

Z80 OP CODES £1.45

A must for the beginner and the experienced programmer alike. This hand ready reckoner lists all 600 plus Z80 machine code instructions in decimal and hexadecimal with their mnemonics. Each Op Code is succinctly explained and cross-referenced. Supplied in a protective transparent wallet for easy reference and durability.

SEND S.A.E. FOR FULL CATALOGUE OF HARDWARE, SOFTWARE & LATEST PRICES

Cheque with order or quote Access or Barclaycard number to: **HEWSON CONSULTANTS**, Dept EC, 60A St Mary's Street, Wallingford, Oxon OX10 0EL.

ECM 8

SINCLAIR 16K RAM DOWN TO £29.95

Sinclair ZX81 microcomputer

now at Cambridge Computer Store!

ZX81 Assembled	£69.95
ZX81 Kit	£49.95
16K RAM	£29.95 *NEW PRICE*
Printer	£59.95 *NEW PRICE*

All units now in stock
Wide range of books, software
and DCP packs also available
in our 'Budget Micros' department.

Cambridge Computer Store

1 Emmanuel Street, Cambridge CB1 1NE
Phone (0223) 358264/65334

Also: Acorn Atom • VIC-20 • Tandy TRS-80

A GREAT NEW GAME FROM

FOOTBALL MANAGER

Addictive Games

for
ZX81
ZX80
TRS80
VIDEO GENIE

JUST LOOK AT THESE FEATURES

★ *AS MANY SEASONS AS YOU LIKE* ★ *4 DIVISIONS* ★
★ *PROMOTION & RELEGATION* ★
★ *FULL LEAGUE TABLES* ★
★ *TRANSFER MARKET* ★
★ *INJURIES* ★
★ *7 LEVELS OF PLAY* ★
★ *SAVE GAME FACILITY* ★
★ *MANAGERIAL RATING* ★
★ *PICK YOUR TEAM FOR EACH MATCH* ★ *F.A. CUP* ★

This is NOT a mere simulation. This is an exciting and highly enjoyable game in which you play the part of a Football Manager coping with the problems and decisions involved in running your club. There are so many features it is impossible to list them here but included are form (top teams NORMALLY win), giant-killings, wage bills to pay, and you can even be sacked! It is a game requiring a great deal of skill, and people play it for literally hours on end (we have proof!).
WE GUARANTEE that this is one of the best computer games you've ever played!
BUT BEWARE, this game is extremely addictive!

FOOTBALL MANAGER *IS SUPPLIED WITH INSTRUCTIONS - OCCUPIES THE ENTIRE 16K RAM*

HARDWARE REQUIRED	
ZX81/ ZX80	*TRS80/ Video Genie*
8K ROM	*LEVEL II*
16K RAM	*16K RAM*

To Order send Cheque/P.O. £7.95 made payable to: ADDICTIVE GAMES at: Dept S.U. P.O. BOX 278 CONNIBURROW MILTON KEYNES MK14 7NE PLEASE STATE COMPUTER

EDUCATIONAL COMPUTING

on the

ZX81

Suit children ages 5-11

No comparable collection offers so much for so little

THE LITTLE PROGRAMMES WHICH ARE BIG EDUCATORS

Here at last. A set of programmes to turn your Sinclair ZX81 into a powerful educational tool. And you don't even need to know programming. There are clear instructions and plenty of tips & advice. Designed to go beyond drill & practice the promote learning through interaction & discovery.

All programmes fit 1K

Creative use of graphics

Many innovative ideas

Fully documented

Includes many games

Educare's **50** 1K PROGRAMMES for PRIMARY EDUCATION

Includes:-

TORTOISE
A simplified version of the famous Turtle programme

CODED MISSILE
Combines the fun of arcade games with learning

£4.95 only incl p & p

Graph-plotter ● Histogram ● Simon-spell ● Sketchboard ● Times-table ● Sets Series-quiz ● XY-coordinates ● Count ● Equations ● Areas ● Guess-a-Volume Angles ● Upstairs-Downstairs ● Music-notes ● See-saw ● Wipe-out ● Spell Temperature ● Clock ● Money ● Snake Mastermind ● Number-shoot ● + 26 more

EDUCARE

To EDUCARE, 139a Sloane St, London SWIX 9AY

Please send me ..... copies Educare's 50.
I enclose cheque/postal order for £.....
Name.....
Address.....

Let your child benefit early. Send now

GAMES PACK

Beat this for value! Five 16K programs Plus two 1K programs

3-D Battle (Mlcode - 1K)
City Bomb (Mlcode - 1K)
Warp Wars (Basic & Mlcode - 16K)
Snake (Basic 16K)
Sweet Tooth (Basic & Mlcode - 16K)
Slalom (Basic 16K)
Black Holes (Basic 16K)

ALL ON ONE CASSETTE FOR ONLY £4.95 ($9.90)

NEW

GRAPHICS TOOLKIT

(another masterpiece by Paul Holmes)

22 exciting MACHINE CODE routines that give you control over your screen as never before!

(ZX81 - 16K RAM ONLY)

Draw/Undraw draws or deletes your multi-character shape which is defined in a REM statement.
Foreground On/Off use this to 'protect' existing characters on your screen.
Border/Unborder draws a border round the edges of your screen area. Edit lines can be used if required.
Fill fills any number of lines you specify, starting at any line you specify, by your chosen character.
Reverse converts all characters to their inverse video, control as in FILL.
Print Position Controls UP, DOWN, LEFT, RIGHT. Alter your next PRINT position in the direction indicated.
Editprint moves next PRINT position to first edit line.
Scroll Facilities UPSCROLL, DOWNSCROLL, RIGHTSCROLL, LEFTSCROLL. Scroll your screen in the direction indicated.
Onscreen/Offscreen turns your screen on or off.
Background On/Off fills your screen by your specified character.

An ESSENTIAL addition to your 16K RAM ZX81

TOOLKIT

(written by Paul Holmes)

Provides the following additional facilities:-

Line renumber - you state starting number and increment value. GOTO's and GOSUB's included in line renumber.
Search and List - searches for and lists every line containing specified character.
Search and replace - changes every occurance of a character as you require.
Free space - tells you how many free bytes you have left.

Search and Replace will search the screen for every occurence of the character you specify and replace it with your new character.
Square draws a square or rectangle from your specified co-ordinates.

All these routines are in machine code for SUPER-FAST response! GRAPHICS TOOLKIT uses only 2K of your RAM and that includes space to load the programmers TOOLKIT described above.

ALL FOR ONLY £5.95 ($11.90)

This includes a cassette with 2 copies of the program, 2 copies of a demonstration program plus a comprehensive instruction booklet with examples.
All prices are fully inclusive

SPECIAL GRAPHICS ROUTINES

Hyper graphics mode - graphics never seen on a ZX81 before.
Fill - fills your screen instantly with your specified character.
Reverse - changes each character on your screen to its inverse video.
TAPE ROUTINE - provides a system WAIT condition until a signal is received in the cassette ear jack.

All these routines are written in machine code and together take up only 1K of your precious RAM an incredible achievement!!

FOR 16K ONLY £4.95 ($9.90)

NEW

BATTLESHIPS & CRUISERS GAME

(16K - ZX81)

First computer version of this popular game of strategy and tactics. Both grids on view together. Establish the position of your fleet then locate and destroy the computer's fleet. Visual display shows hits and misses made and gives running score.

ONLY £4.95 ($9.90)

As reviewed in "Your Computer" March 1982

16K RAM PACK

ONLY £29.95 ($49.95)

Quite simply the best available plus FREE 'Alien Attack' (7K Mlcode) on cassette - Value £5.75 ($11.00).

Fully built tested and guaranteed. Uses existing power supply (min. 600 m.a.)
Compatible with printer.
No wobble problems.
Gold plated edge connector for perfect contact with your ZX81.
Normally despatched within 10 days of receipt of your order.

With advances in microtechnology we are now able to offer the **64K RAM PACK.**
Same quality as the 16K but giving massive memory to your ZX81, with external dimensions no larger than the 16K Ram Pack (above).

ONLY £82.95 ($119.95)

OVERSEAS CUSTOMERS PLEASE NOTE: ALL PRICES ARE APPLICABLE FOR EXPORT, INCLUDING AIRMAIL POSTAGE. PAYMENT MAY BE MADE IN STERLING MONEY ORDER AVAILABLE AT YOUR BANK OR YOUR OWN U.S. $ CHEQUE MADE PAYABLE TO JRS SOFTWARE. DESPATCH NORMALLY 7 DAYS FROM RECEIPT OF ORDER.

JRS SOFTWARE

19 WAYSIDE AVENUE, WORTHING, SUSSEX. BN13 3JU Telephone: (0903) 65691

Pretend to be Ian Botham: win a printer

This month we are awarding the last of our five Sinclair printers in our monthly competition, for which we expect the response to be as good as for the first four.

To continue the emphasis of our Bumper Summer Special, we would like you to write a program to simulate the game of cricket. There is no limit to the size of memory which can be used but we must insist that entries are on cassette, accompanied by a typed or beautifully hand-written listing.

The judges will be looking for a program which attempts to include as many of the complexities of the game as possible. The Owzat form of the game will not be sufficient.

As a tie-break, should one be necessary, we want you to write a slogan beginning with the words: "I read *Sinclair User* because. . . . . "

Entries must reach us by August 16.

The usual rules about the editor's decision being final and employees of ECC Publications being ineligible apply.

ENTRY FORM

Complete this slogan, which will be used as a tie-break: I read Sinclair User because .....

Name .....

Address .....

.....

Send your entries to ECC Publications, 30-31 Islington Green, London N1 8BJ to arrive not later than August 16.

ZX81 16K

TASWORD

WORD PROCESSING ON THE ZX81!

Your ZX81 becomes a word processor with TASWORD. Type in letters, documents and pictures, store them on tape, and edit and update existing documents. With a printer, which is not essential, you can print your documents.

TASWORD FEATURES INCLUDE

- **OVER 300 LINES** of text in a text file.
- **CURSOR CONTROL** and auto repeat on all keys.
- **SCROLL** up and down through the text file.
- **AUTOMATIC** word-wrap and right-justification.
- **FULL ZX81** character set including inverse characters and graphics symbols.
- **INSERTION AND DELETION** of lines and characters.
- **A HELP PAGE** onto the screen at the touch of a key.
- **CENTRE** text on the screen, and move text left and right.
- **REFORMING** of edited text to a neat layout with a single keystroke.

TASWORD TUTOR

We send you a manual and a cassette. One side contains TASWORD. The other side contains TASWORD and TASWORD TUTOR. This teaches you word processing using TASWORD. No programming knowledge is required to use TASWORD.

£6.50 fully inclusive

Mail order only. Allow up to 14 days delivery.

Please make cheques/P.O. payable to

TASMAN SOFTWARE

17 HARTLEY CRESCENT, LEEDS LS6 2LL

ZX Software

SCREEN KIT 1 MORE POWER TO YOUR SCREEN in Basic programs

BORDERS - any size - anywhere on screen
SCROLL - in ALL FOUR directions
FILL SCREEN - any graphic or character
CLEAR and REVERSE PART OF SCREEN - any part
FLASHING CURSOR - anywhere on screen - simulates INPUT

ZX81 4K to 64K

with **DATA FILES**

SAVE BASIC VARIABLES on cassette
LOAD back into ANY program
all at DOUBLE SPEED

and MEMORY LEFT

- 880 bytes of machine code gives **INSTANTANEOUS SCREEN RESPONSE**.
- Becomes part of your Basic program.
- Can be added to existing program.
- No need to Load separately.

SUPERB VALUE £5.70 Inc VAT & P+P C.W.O.

ZX-MC MACHINE CODE DE-BUG/MONITOR

At last, **COMPLETE FREEDOM FROM BASIC** for machine code programmers

- Versatile entry commands for Hex code and String entry.
- Comprehensive Run & De-bug commands, including REGISTERS DISPLAY & BREAKPOINTS.
- Hex dump to printer for hard copy.
- 16 essential commands for M/C programming.
- Occupies 2½K RAM in Basic area.
- Supplied on cassette with 36 page manual.

• SAVE, LOAD, VERIFY AT DOUBLE SPEED from any part of RAM.

- Fast machine code routines operating from Basic area of RAM.
- Write your M/C programs above Basic area - Screen memory (D-FILE) never moves.
- SELF CONTAINED design, for the serious programmer - cannot be used with Basic programs.

£7.50 Inc VAT & P+P C.W.O.

ZX81 4K to 64K ZX SPECTRUM version available soon

REM-LOAD MACHINE CODE ENTRY/DE-BUG

- A version of ZX-MC without the SAVE/LOAD/VERIFY facilities.
- **ENTER, RUN, DE-BUG** machine code in Basic REM lines.
- Operates from above RAMTOP.
- Compatibility with Basic.
- Supplied on cassette with 30 page manual, for ONLY —

SAE for more details of software

£6.95 Inc VAT & P+P C.W.O.

ZX81, 16K to 64K ZX SPECTRUM version available soon

Picturesque

6 CORKSCREW HILL, WEST WICKHAM, KENT BR4 9BB

Mail order only — Allow 14 days delivery

PLEASE STATE COMPUTER MODEL

SILVERSOFT

personal computer software

ZX81/16K SOFTWARE

☐ **"STARTREK"** **£4.95**

16K STARTREK: Exciting space adventure game including klingons starbases, phasors, 8 × 8 galaxy, 4-levels of play, long and short range scanners, etc.

☐ **"SUPER-WIMPUS"** **£4.95**

16K SUPER WUMPUS: Can you hunt and catch the mysterious wumpus in his underground labyrinth? Intriguing underground adventure.

☐ **"GRAPHIC—GOLF"** **£4.95**

16K GRAPHIC GOLF: Try out your golfing expertise, on the computer's golf course, 18-different graphically display holes. Hazards, include lakes, trees, wind, rough etc.

☐ **"GAMES PACK 1"** **£4.95**

16K GAMES PACK 1: Fantastic value for money, nearly 50K of programs on one cassette. Five games including "Real Time Graphic" Lunar Lander, Starwars, Hammurabi, Minefield, Mastermind.

ZX-ARCADE ACTION

☐ **NEW!! "MUNCHER!!"** **£5.95**

At last Pacman for your ZX-81, all the arcade features plus!? software for the QS character board.

☐ **"SPACE-INVADERS"** **£4.95**

Simply the best yet, the closest thing to real Invaders on the ZX81. Full arcade features! including 1 or 2 player option and software to drive the QS character-board.

☐ **"ASTEROIDS"** **£5.95**

Authentic representation of the arcade game including L, R, thrust and fire controls, 5-levels of play and alien spaceships.

☐ **"DROPOUT"** **£5.95**

Exciting NEW arcade game. Can you destroy the aliens before they build up in their atomic plies and overwhelm you.

Dealers enquires welcome, generous discounts.

When ordering 2 or more deduct £1.00. Send S.A.E. for Catalogue.

Tick boxe(s) required.

Cheques/POs payable to "SILVERSOFT".

Name .....

Address .....

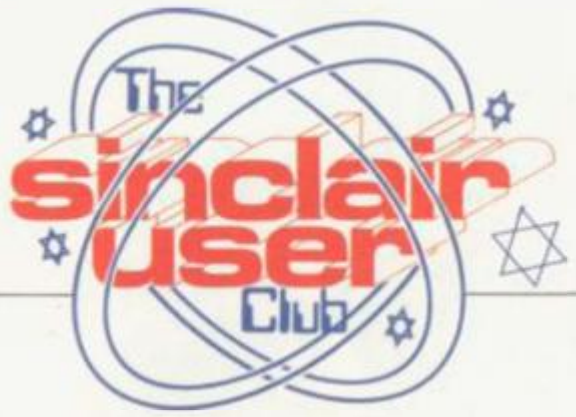
.....

WANTED ZX81, Spectrum, BBC Micro Software

Excellent Royalties — S.A.E. for details.

All Arcade games run in 4K

SILVERSOFT (Dep. SU7)
35 Bader Park, Bowerhill,
Melksham, Wiltshire.



Membership fee can be recovered

Prices cut by Thurnall

FOLLOWING the good response to our Sinclair User Club, we have decided to make an extra special series of offers to our growing membership this month.

Two offers will be available exclusively to club members. If advantage is taken of both, they will cover the cost of membership many times over.

We are able to allow members the opportunity to buy a series of software items and hardware add-ons at discount prices.

Members will be able to obtain a 20 percent discount off all the J K Greye range of software. J K Greye produces some of the best software on the market. Following its remarkable 3D Monster Maze, recently it has introduced 3D Defender, which our reviewer this month considers to be another success.

Those and the rest of the J K Greye range are now available at a discount of 20 percent.

The offer is available only through the Sinclair User Club and cannot be obtained in any of the retail outlets which stock the J K Greye range.

Our other offer features Thurnall Electronics, which produces a number of hardware add-ons for the ZX-81. Among the products available from Thurnall are input/output ports, motherboards and joysticks.

All these Thurnall goods we can offer to members at a discount of 10 percent.

The discounts from J K Greye and Thurnall Electronics are open until the end of August. To allow new members to take advantage of these very generous offers you can include an order with your membership application. A form is printed below.

J K Greye Software	List price	Club price
Gamestape	£3.95	£3.15
Gamestape 2	£3.95	£3.15
Catacombs	£4.95	£3.95
3D Monster Maze	£4.95	£3.95
3D Defender	£4.95	£3.95
Breakout	£1.95	£1.55

Thurnall Electronics	List price	Club price
Input/output port (kit)	£14.95	£13.45
assembled	£17.95	£16.55
Four-channel relay box	£14.95	£13.45
Eight-way transistor driver	£9.95	£8.95
Eight-way indicator unit	£12.95	£11.65
Joystick	£12.95	£11.65
Motherboard	£15.95	£14.35
Power supply	£4.95	£4.45

Full details of all these items can be found in advertisements in *Sinclair User*.

Facilities to include Spectrum

THE USER CLUB is to expand its facilities to cater for the growing number of Spectrum owners. For the same annual subscription of £12 they will be able to take advantage of the extra benefits which have been available to other ZX owners for the last two months.

The benefits include the bi-monthly, cassette-based newsletter which is being re-recorded so that it can be used with the Spectrum and will contain Spectrum programs.

To ensure that each member receives the correct cassette, please denote which machine you own by ticking the box on the application form below.

Meet the first member of our club on p.62

MEMBERSHIP FORM

I wish to join the Sinclair User Club and enclose my subscription of £12

Name .....

Address .....

.....

.....

.....

Which computer do you own?

ZX-81 ☐ Spectrum ☐

Send your coupons to Sinclair User Club, ECC Publications, 30-31 Islington Green, London N1 8BJ. Cheques should be made payable to Sinclair User Club.

Sinclair helps in work, rest and play

THE FIRST member of our Sinclair User Club is an enthusiastic Sinclair supporter. He was one of the first to obtain a ZX-81, he took a year's subscription for *Sinclair User* as soon as it was announced and he placed his order for the Spectrum some time ago.

"When Sinclair brought out the ZX-80 I decided to wait, but when the ZX-81 arrived I put in an order straight away, "Peter Lown, 62, of Strathmore Avenue, Hull, North Humberside, said. He bought it with the 16K RAM pack and the printer.

A telecommunications manager with a large international company, Lown has made full use of his system both for work and in his hobby of motor sport.

"I use it to run telephone traffic analysis. It is not complicated, just number-crunching, but there is a good deal of work involved and it saves me plenty of time", he said.

Recently he has developed a program to display details and results of motor rallies. A friend has built him a regulator for converting 12V supply to the 9V needed for the Sinclair to be used away from a mains supply.

It had its first showing towards the end of June in the Cossack Rally in North Humberside. At the start it listed details of the competitors, scrolling them up so that all of them could be included. At the end it provided the results.

"It took about 25 minutes to input all the figures but we were able to do it as the cars arrived so the results were ready within two minutes of the last competitor finishing, which was the time needed to sort through all the information," Lown said.

He first had contact with computers 25 years ago and was a founder member of the Hull and District branch of the British Computer Society. In those days he was working on a National Elliott machine which, though having the same capacity as the ZX-81, was the size of "a side of a house".

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.
Edinburgh ZX Users' Club: J. Palmer (031 661 3183) or K Mitchell (031 334 8483). Meetings: second Wednesday of the month at Claremont Hotel.
EZUG-Educational ZX-80/81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.
Glasgow ZX-80/81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth monday of each month.
Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).
Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire, PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.
Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).
National ZX-80 and ZX81 Users' Club: 44-46 Earls Court Road, London W8 6EJ.
North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.
North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.
Nottingham Microcomputer Club: ZX-80/81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.
Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent, (Orpington 20281).
Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.
Post Office Users' Club: Vernon Quaintain, Head Post Office, St Martin's le Grand, London, EC1.
Scunthorpe ZX Club: C P Hazelton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).
Sheffield: Andrew Moore, 1 Ketton Avenue, Sheffield S8 8PA would like people interested in starting a club in the area to contact him enclosing a stamped-addressed envelope for details.
Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.
ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworth, Bury, Lancashire. Exchanges information and programs throughout the country.
ZX-80/ZX81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgium, France, Luxembourg: Club Sinclair, Raymond Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468)
Belgium, Netherlands: Microcomputer Vereniging BZW, Paul Glenisson, Priester de l'Epéestraat 14, B-1200 Brussels, Belgium (322 7349954)
Denmark: Danmarks National ZX-80/81 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.
East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).
Germany: ZX-80 Club, a postal club; contact Thomas Jenczyk. Hameln, Postfach 65 D-3250 Hameln, Germany.
Indonesia: Jakarta ZX-80/81 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.
Republic of Ireland: Irish ZX-80/81 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.
Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana.
United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611. — Harvard Group, Bolton Road, Harvard MA 01451; (617 456 3967).

special offer

EXCLUSIVE SINCLAIR USER OFFER

Build your own Sinclair Special ZX-81 Kit Offer

ONLY £29·95 (plus p&p)

SAVE £20 on a Sinclair ZX-81 kit. A special offer open only to readers of *Sinclair User* has been negotiated with Sinclair Research, which means you can buy the world-beating ZX-81 for just £29.95 (plus post and packing).

Stocks are limited, so be sure to place your order soon. Allow 28 days for delivery. Maximum four units per applicant.

To: Sinclair User Special Offer,
ECC Publications, 30-31 Islington Green, London, N1 8BJ

Please send me _ _ _ _ _ ZX-81 kit(s) at the special *Sinclair User* price of £29.95 plus £2.95 p & p.

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £____

*Please charge to my Access/Barclaycard/Trustcard account no. _____

*Please delete/complete as applicable

Signature _____

Name Mr/Mrs/Miss _____

Address _____

ZX81 SOFTWARE

NIGHT GUNNER

Enemy aircraft approaching from the rear!! Can you defend your plane against enemy attack? Beware, the more you shoot down, the faster they get.

An exciting machine code video game with impressive graphics. Features include: best score of the day, auto-repeat on the control keys, auto-return to the self demonstrating title page.

Requires 16k RAM. Supplied on tape, with instructions.

Action packed fun for only £3·45

FIGHTER PILOT

15 feet.... 7 feet.... Touchdown!

Another successful instrument landing Appoaching at 150 knots is not always as easy as this. You are in full control from take-off to landing during this real-time flight simulation of a jet fighter. The sky is the limit! Fly a different mission every time. Endless scope for improving your instrument flying skills

16k RAM Required. Suppied on tape, with full instructions.

Supervalue at £3·45

All prices inclusive (Overseas add £0·55 p&p per tape)
All products guaranteed, refund if not satisified

Digital Integration.
22, Ash Church Road,
Ash, Aldershot,
Hants, GU12 6LX.

MAIL ORDER ONLY

ABERSOFT

7 MAESAFALLEN, BOW ST, DYFED, SY24 5BA

ZX81 & Spectrum Games

Now NEW LOW prices!!!!

PROGRAM	OLD	NEW 81	SPECTRUM
Chess 1.4 10 levels m/c	10.00	8.95	
Adventure 140 locations based on the original (At £10.00 well worth the money Sinclair User Issue 2 review)	10.00	8.95	9.95*
Invaders Fast m/c arcade action	5.00	4.45	
Mazeman All the features of the original arcade version m/c	5.00	4.45	4.95

*requires 48k Spectrum

All prices are inclusive
Return of post service

Ultra-Tech Services offer for mathematicians & students the following programs on cassettes, for the 16K ZX-81.

1. **Complex Numbers**
   This program provides 19 operations and functions to apply to complex numbers.
2. **Non-Linear Equations**
   Solution algorithms for both real and complex roots of equations.
3. **Numerical Analysis**
   Integration, regression and Monte-Carlo methods, for the ZX-81.

Each cassette costs £6.95 (inc.VAT) or all 3 may be purchased for £18.00. Cheques or postal orders made payable to M.V.R.H. Ltd. should be sent to:

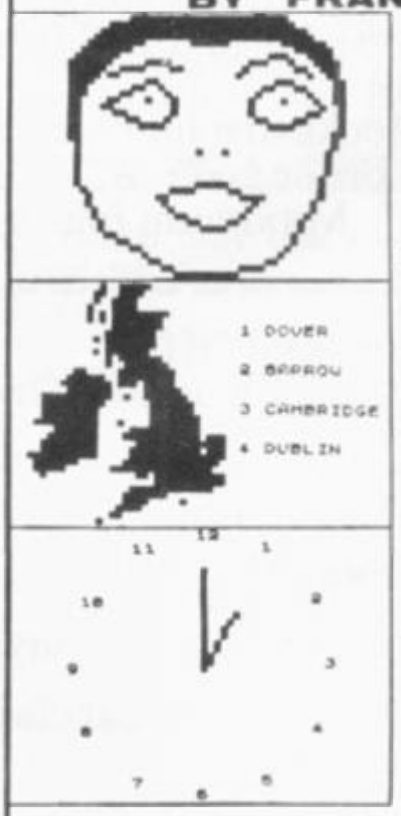
Ultra-Tech Services
30A, Billing Road
Northampton.

ZX 81, SPECTRUM OWNERS

IT'S HERE! THE BOOK YOU'VE BEEN WAITING FOR!

LEARN WITH YOUR SINCLAIR MICRO-COMPUTER

BY FRANK ORVILLE



LOOK AT THESE PROGRAMS:-

ALPHABETICAL ORDER Input up to 450 words. The computer sorts them.

*ANTI-AIRCRAFT GUN A very enjoyable game.

MORTGAGE Works out all the information you need to know about mortgage loans for house purchase.

*DRAWING Draw trees, faces. Make your drawings come alive.

CALENDAR Print out a calendar starting in any year.

LETTER WRITING Store up to 20 names and addresses. Write letters fast.

WORD GUESSING TYPING An amazing typing program which remembers up to 200 words from your text and every time you type in a new letter, it attempts to guess at the word you are currently typing. If the guess, printed below the line, is correct, the complete word is placed with a following space in one stroke.

*GEOGRAPHY QUIZ Draws a map of the British Isles and works through a 25 round quiz in which you have to pick out the name of the flashing location. Very educational.

ALSO If you have a full-sized keyboard, you can teach yourself to type.

*Programs not suitable for Spectrum.

Learn With Your Sinclair Micro-Computer £5 inclusive
Book with set of cassettes £12.50 inclusive

Send P.O. or crossed cheque made payable to Mr.P.L.Donovan, to:-

Mr.P.L.Donovan,
20 Dixon Drive,
Stonerygate,
Leicester LE2 1RA

ZUCKMAN

The first authentic ZX81 (16K)version of 'PUCKMAN'

- ***ALL Machine Code** (uses 10K)*
- ***FOUR Independent Ghosts***
- ***Trail, Energy Posts etc.***
- ***High-score 'Hall of Fame'***
- ***Authentic Arcade Action***

only £5.95 inc. P&P from:

DJL SOFTWARE,
9 Tweed Close, Swindon, Wilts.
** Return-of-post delivery **

MUSIC LEARNING AIDS — a range of programs for 16K ZX81 to help young people learning to read music. Sae, please, for free catalogue. Brian Negus, 19 Westfield Drive, Loughborough, Leics LE11 3QJ.

For ZX81 with 16K RAM. Three programs on one cassette. Flight Demonstration, Flight Simulation and Flight Test. These are semi-serious programs using an aircraft digital instrument panel. £5 cassette and instructions. Sqn Ldr Peter Evans, 5 Broadmeadow, Bolton BL7 9AY.

ZX-81 KITS

Cure Top Line Slant and Ram Pack Wobble £2.95. Inverse Video Module £2.95. Built £3.55. Repeat Key £3.75. Built £4.95. All Kits ex-stock. Please add 40p P/P.

Mr B. A. Reader,
45 Alfred St, Kings Heath,
Birmingham B14 7HG

16 ZX81 HAM RADIO program. Data handling program for Ham Radios. Listings available at £4.00 each. Send s.a.e. for details or orders for Ham Radio to B.L. Cotgrove, 46 Arcadian Gardens, Hadleigh, Benfleet, Essex.

ZX81 with 16K hardly ever used like brand new, still in box, together with books and software worth £38. Bargain at £110 worth £145. Write to Tariq Mir, 5 Beatrice Rd, Southall, Middlesex or phone (Fri-Sun, midday-midnight only) 571-0777.

LET YOUR ZX81 help you win money on horse races. This fabulous 1K programme picked 8 winners from 8 races on the very first day it was ever tested (20.3.82). Send a cheque or P.O. for £10.00 for the cassette and full operating instructions to the Butronics Co., 45 Brompton Road, London SW3. (Mail order only please).

EDUCATION

Computers For Education present their 'Learn About It' Series for the ZX81 (16K). This series has been written by teachers and is a true educational tool. The programs are suitable for use with children aged 7-12 years. Each program is menu driven and makes full use of graphics.

Parents and teachers:- these programs really will give your children an unfair advantage!

Tape

No.	*Side A*	*Side B*
1.	Telling Time	12/24 hr clock
2.	Reading graphs	Graph plotting
3.	Learning fractions	Using fractions
4.	Volume/capacity	Area/perimeter
5.	Mental arithmetic	Spelling

£4.00 per cassette (2 programs) or **£18** for the complete series.

P.O. or cheques to:

COMPUTERS FOR EDUCATION
58 Dovecote Lane, Springhead, Oldham

ZX PRINTING SERVICE FOR YOUR ZX80 (8K ROM)/ ZX81 programs. Only 1 pence for 3 lines of 32 characters, plus 20 pence p + p. (minimum 50 pence please). Send cheque/PO to: T.F. Payne, 194 Stockwood Lane, Stockwood, Bristol BS14 8NG, enclosing your program-cassette and details of program name(s) and your name and address.

ZX81 MULTISEQUENCER

Using unmodified ZX81-16K (apart from amp) this program provides you with an instrument covering over 5 octaves with full editing facilities to write 37 independent sequences of up to 16 notes, which can be played in any order under realtime control. Tunes are stored when program saved. Fast tempo gives synthesiser effects. Music type notation throughout.

Send £5 for cassette and instructions to: V. Haynes, 10 Ashlake Rd, Streatham, London SW16

ZX-81 TEMPERATURE SENSORS.

Uses earpiece socket, with application program listing and waterproof probe. Including UK p&p £17.50. Free leaflet. Cheshire Micro Design, 66 Close Lane, Alsager, Stoke on Trent.

ZX81 — 16K RAM. Sinclair learning lab and 2nd hand tape recorder, also magazines and labyrinth game, a bargain at £85. Phone Ingrebourne 76446.

sinclair supermart

SOFTRAX
ZX81–16K
NEW

DRAW POKER
Start with a credit of £10 and become a multi-millionaire or lose everything! An addictive game based on mathematical probability and including recognisable graphics!
On cassette only £3.95

BINGO
Don't be unsociable! Share your ZX81 with family and friends in a pleasant game of bingo. The computer produces as many tickets as you want and displays the number board and draw. (Printer required)
On cassette only £3.95

Both programs on one cassette only £6.40

All prices inc. p&p

Cheques or P.O.s to:-
SOFTRAX (Dept S.U.),
26, Third Avenue,
Bath,
Avon

Mail order only

2X81 SOFTWARE
Stockexchange

Try your hand at making a fortune on the stockmarket. Very realistic game. Supplied on cassette **16K £5.95.**

Rubic Solver
Program to solve the Rubic cube supplied on cassettee. **16K £2.95.**

All Prices inclusive
Programs fully guaranteed
SR Software
61 St Stephens Avenue
London W12 8JE. Mail order only.

3 MACHINE CODE GAMES For the 16K-ZX81

BYTE-MAN — The ZX version of the popular Puckman Arcade Game.
SPACE-FIGHTER — Fly into battle against the limitless forces of the enemy.
BRIDGE BOMBER — Do as much damage as you can with a limited payload.

All for only £2.95
From MINDSEYE
12 North Grove Drive,
Leeds LS8 2NJ.

P-E-P

THE PROGRAM ENHANCEMENT PACKAGE FOR THE ZX81 (16K)
A suite of easy to use machine code routines designed to transform your Basic programs.
☐ **DEFINED SCROLL REGION** 1 line to whole screen. ☐ **SCROLL** up or down. ☐ **FILL SCREEN** any character. ☐ **CHANGE BACKGROUND** ☐ **CHANGE FOREGROUND** ☐ **INVERSE VIDEO** ☐ **FLASH SCREEN** ☐ **CLEAR SCREEN** without changing print position.
Supplied on tape with a **6K DEMO PROGRAM** and a FULL instruction booklet
ONLY £5.95 incl. p&p

16K GAMES PROGRAMS
GOLF 1 or 2 Players Fantastic graphics
MINEFIELD Steer your tank to safety. Very addictive.
INVADERS With sneaky '**SMART BOMBS**'.
MANHUNT Evade the Relliks if you can
FANTASTIC VALUE AT ONLY £3.75 each incl. p&p
Send to **R & R SOFTWARE**
34 Bourton Road,
GLOUCESTER GL4 0LE
TRADE ENQUIRIES WELCOME

PROBLEM WITH YOUR ZX81? CAN'T GET SERVICE FROM UNCLE CLIVE? CALL THE SPECIALIST. FAST, EFFICIENT SERVICE ON ALL TYPES OF REPAIRS. PHONE 01-703 5740 NOW.

MICRO Surgery

Available by mail. Please enclose machine together with PO/Cheque for £7.00 to include diagnosis, and return carriage, or call in 242 Old Kent Road, London SE1 5UB.

LATEST SCORE — LATEST SCORE — LAT
— MZ 80K — ZX 81 — MZ 80K — ZX 8
USTER — AUSSIEBUSTER — AUSSIEBU

POOLS FORECASTING PROGRAMME

Especially designed for Australian results
Star Value — Both programmes with printer options
ZX81 — £9.00 MZ 80K — £16.00

POOLSOFT
17 Blatchington Rd, Seaford, E. Sussex, BN25 2AB
Tel. (0323) 890604

sinclair supermart

sinclair supermart

MICRO WARES

MAKE MONEY, unique program shows how. "At Last", **£3.95.**

SAIL A YACHT, against wind, tides, hazards, adjust sails etc. "Sailing", **£3.95.**

For Spectrum/ZX81-16K. On quality checked tapes.

20 Winstree, Basildon, Essex, SS13 1PG.

ZX81 16K software

COSMOS — save your fleets from the marauding aliens in this new m/c space game with dramatic graphics on your ship's sensor screen. £5.99

TABLE TUTOR — complete menu driven course in multiplication tables with examples, tests, homework and answer service for the under 10's. £3.99

QUARTET — a compendium of crosswords, puzzles and memory game (multiplayer) with up to 10 difficulties. £3.99

TRIAD — three new puzzles to perplex and frustrate even Cubists. £3.99

Supplied on cassette, s.a.e. for catalogue, Vortex Software, 26 Crawford Road, Hatfield, Hertfordshire AL10 0PG.

ZX81 + 16 K RAM £65 ono, Sinclair built. D. Wright, 3 Burford Ave, MCR M31 1SH. Tel 061-748 2175.

ZX81 + 16K RAM Sinclair built, in original packing. All leads and manual. Some books and cassettes, can deliver. £95 ono. S. Mannon, 37 Cloverdale, Stoke Prior, Bromsgrove, Worcs. Tel. Bromsgrove 70779.

SINCLAIR BUILT ZX81 & 16K ram pack. Plus leads, manual and power pack. All still boxed. Also 10K 3D maze program. Everything, a bargain at £95. Nicholas Barker, Highfield, Dairy Lane, Walberton, Arundel, Sussex BN18 0PT. Tel. YAPTON 551315.

ZX81 16K "G3ZHY MORSE CODE TUTOR" Teach yourself Morse Code with this comprehensive self-tutor. Selectable options to include letters, numerals, punctuation, user text; 5-30 wpm, variable groups, random/serial sequence, video check-back. uses cassette o/p socket. Available on TDK AD-C46 cassette with full instructions £5.00. M.R. Irving G3Z, 22 Wheatley Way, Chalfont St Peter, Bucks SL9 0JE.

SINCLAIR ZX81 with 16K Ram Pack, manual, leads and adapter. Also includes a unique anti-glitch capacitor, 8 cassettes of software, books and magazines. Offers in the region of £100. For further details; Tel: Thatcham (0635) 644098.

If you have problems trying to make a program send all the details of what you want in it and I will try and do it for only £2.50 for 1K games and £3.00 for 16K games. If you want any programmes copying please send the listing to me and I will send the program back for only £1.50 for 1K games and £2.50 for 16K games. If any of you have a 4K graphics rom I will make any games you want for only £3.00. All the programmes are changed each month.
Paul Waite, 3 Cornwall Ave, Mansfield, Notts NG18 3JG.

UNIQUE ZX81 games and pastimes requiring skills of concentration and reaction. Please send SAE for free list. G. Carr, 'Sero-Sed-Serio', Tunbeck Rd, Wortwell, Norfolk IP20 0HP.

16K ZX81 + DK graphics board + Kayde keyboard (cased) + Bi-Pac Sound Box. Many software cassettes, including Asteroids, Space Invaders, chess and centipede + 1 book. All for £125 o.n.o. Ring Lymington (0590) 76319.

16K ZX-81 with manual, leads, etc., five of the best 16K games around on original cassettes, include Chess, 3-D Monster Maze, Star Trail etc, plus book on machine code (worth £7). Only £110. If you don't believe this is a bargain, just ring 061-339 9446 for more details, or write to 49 Crowhill Rd, Ashton-under-Lyme, Lancs OL7 9MB.

ZX81 — 16K
FOOTBALL POOLS PROGRAM

* Lists out, in order of preference, the 16 most likely score-draws; also the 16 most likely homes, draws and aways.
* Picks out the results on the bookmakers' **Fixed Odds** coupons that have been given over-generous odds. Calculates your expected profit!
* Allows the user to update the tables week by week as results come in.

For a cassette of the program, plus an instruction leaflet giving a brief explanation of the theory send £5.95 to:

HARTLAND SOFTWARE
(Dept. S)
8 PENZANCE PLACE, LONDON W11 4PA

ZX-81 16K ADVENTURE GAME. Full 16K used. Plenty of Action — map supplied, plus detective game of Logic (2-21 players). Both on cassette only £3.50. S. Taylor, 2 Greenway, Eltham, London SE9 5SZ.

ZX-81 plus 16K RAM. Thirteen programs on cassettes. Manual, book and mains adaptor. Mint cond. £85. K Macdonald, 13 Cookson Rd, Sheffield, Yorks. (0742) 349943 anytime.

SCHOOL CHILDREN! I have developed a program to enter and RUN standard CESIL programs on a 4K (or more) ZX81: Cassette for £4.95 from Timothy Skinner at, 1, Summer Drive, Hoveton, Norfolk NR12 8DY.

ZX81 with 16K. Instruction books and ICL programming course and tapes, including all leads, and two games. £80 ono. S. Leigh, 47 Middle Lane, Epsom, Surrey. Tel. Epsom 28218.

Sell your used computer or peripherals through Sinclair Supermart at low cost ... up to 30 words for only £5.

Have you updated your computer or do you no longer use that add-on? Instead of leaving it lying around, turn it into cash be placing a classified advertisement in Sinclair Supermart and reach around 40,000 users of the Sinclair ZX systems.
Please write your advertisement in the boxes below, one word per box. Underline words required in bold type. Your name, address and/or telephone number should be included *Please print in block capitals.*
Note—this service is open only to private advertisers. The advertisement will appear in the earliest possible issue.

Name: .....

Address: .....

..... Tel: .....

Have you included the fee of £5?

Conditions
The Advertisement Manager reserves the right to alter, reject or suspend an advertisement without assigning any reason. Advertisements are accepted subject to approval of copy and to the right of the Advertisement Manager to alter, reject or cancel any order without explanation. The Proprietors are not liable for any loss from any cause whatever, nor do they accept liability for printers' errors. The Advertisers shall indemnify the Publishers in respect of any claim, cost and expenses arising out of any libellous or malicious matter or untrue statement in any advertisement published for the advertisers, or any infringement of copyright, patent or design therein. The placing of any order will be deemed to be an acceptance of these conditions.

AD INDEX

Addictive Games	58	Kempston	41
P. Altwasser	17	Melbourne House	4
Afdec Electronics	17	Moviedrome Video	54
Abersoft	64	Microware	54
Artic Computing	42	M.C. Associates	44
Buffer Micro Shop	26	Microfair	26
Computex Cases	8	Memotech	23
Cambridge Computer Shop	58	Newnes Technical Books	54
D.K. Tronics	67	Oasis Software	42
Data Assette	18	M. Orwin	2
Digital Integration	64	Occam Software	12
P.L. Donovan	64	Picturesque	60
Educare	58	Phoenix	22
D. Fritsh	17	Pss	20
Fuller Micro	28	Mr Readman	57
Hewson Consultants	57	Read-Out	49
Haven Hardware	46	Sinclair	11, 52-53
Hilderbay	42	Silicon Tricks	54
Interface	46	Silversoft	60
JPS	22	Supermart	65-66
J.K. Greye	12	Serious Software	46
JRS	58	Software Farm	22
J.G. Prince	12	Tasman	60
Kayde	68	Timedata	26
		Ultra-Tech	64
		Workforce	57

sinclair supermart

MICHAEL ORWIN'S ZX81 CASSETTES

THE BEST SOFTWARE (BY VARIOUS AUTHORS) AT LOW PRICES

QUOTES

"Michael Orwin's £5 Cassette Two is very good value. It contains 10 stolid well designed games which work, offer plenty of variety and choice, and are fun."

From the ZX Software review in
Your Computer, May '82 issue.

"I had your Invaders/React cassette . . . I was delighted with this first cassette."

P. Rubython, London NW10

"I have been intending to write to you for some days to say how much I enjoy the games on 'Cassette One' which you supplied me with earlier this month."

E.H., London SW4

". . . I previously bought your Cassette One and consider it to be good value for money!"

Richard Ross-Langley
Managing Director
Mine of Information Ltd.

CASSETTE 1
(eleven 1k programs)

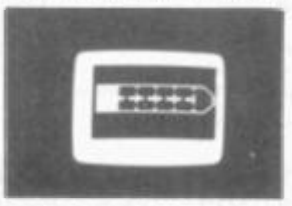
machine code:
React, Invaders, Phantom aliens, Maze of death, Planet lander, Bouncing letters, Bug splat.
Basic:
I Ching, Mastermind, Robots, Basic Hangman. PLUS Large screen versions of Invaders and Maze of Death, Ready for when you get 16k.
Cassette One costs £3.80

CASSETTE 2
Ten games in Basic for 16k ZX81

Cassette Two contains Reversi, Awari, Laser Bases, Word Mastermind, Rectangles, Crash, Roulette, Pontoon, Penny Shoot and Gun Command.
Cassette Two costs £5.

CASSETTE 3
8 programs for 16k ZX81

STARSHIP TROJAN

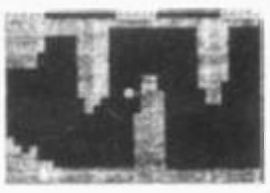


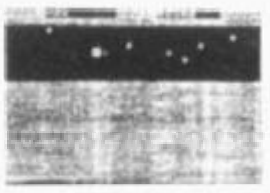
Repair your Starship before disaster strikes. Hazards include asphyxiation, radiation, escaped biological specimens and plunging into a Supernova.

STARTREK This version of the well known space adventure game features variable Klingon mobillity, and graphic photon torpedo tracking.
PRINCESS OF KRAAL An adventure game.
BATTLE Strategy game for 1 to 4 players.
KALABRIASZ World's silliest card game, full of pointless complicated rules.
CUBE Rubik Cube simulator, with lots of functions including 'Backstep'.
SECRET MESSAGES This message coding program is very txlp qexi jf.
MARTIAN CRICKET A simple but addictive game (totally unlike Earth cricket) in machine code. The speed is variable, and its top speed is very fast.
Cassette 3 costs £5.

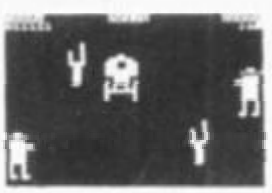
CASSETTE 4 **8 games for 16k ZX81**

ZX-SCRAMBLE (machine code) with 3 stages.
Bomb and shoot your way through the fortified caves.

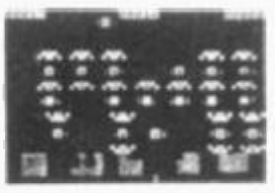


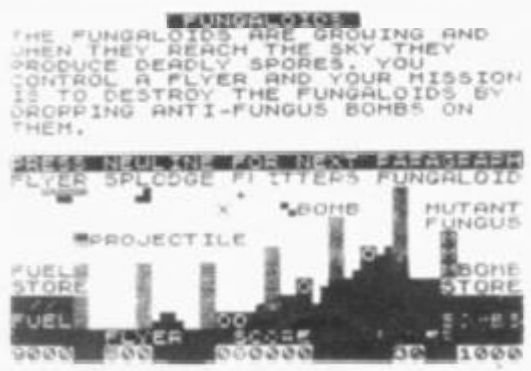


GUNFIGHT
(machine code)



INVADERS
(machine code)





GALAXY INVADERS (machine code)
Fleets of swooping and diving alien craft to fight off.
SNAKEBITE (machine code)
Eat the snake before it eats you. Variable speed. (very fast at top speed).
LIFE (machine code)
A ZX81 version of the well known game.

3D TIC-TAC-TOE (Basic)
Played on a 4 × 4 × 4 board, this is a game for the brain. it is very hard to beat the computer at it.

7 of the 8 games are in machine code, because this is much faster than Basic. (Some of these games were previously available from J. Steadman). Cassette 4 costs £5.

Recorded on quality cassettes, sent by first class post, from:
Michael Orwin, 26 Brownlow Rd., Willesden, London NW10 9QL (mail order only please)

KAYDE Electronic Systems

ZX80/1
ZX KEYBOARD WITH REPEAT KEY

£37.95 inc VAT

Fully cased keyboard £37.95
Uncased keyboard £27.95
Keyboard Case £10.95

This is a highly professional keyboard using executive buttons as found on top quality computers. It has a repeat key and comes complete in its own luxury case. This is a genuine professional keyboard and should not be confused with toy keyboards currently available on the market.

KAYDE 16K RAM PACKS

£29.95 inc VAT

The 16K RAMPACK simply plugs straight into the user port at the rear of your computer. It is fully compatible with all accessories and needs no extra power and therefore it will run quite happily on your Sinclair power supply. It does not over-heat and will not lose memory at all. As you may know some makes go down to 11K after being on for a while.

This 16K RAMPACK is very stable and will not wobble or cause you to lose your programme. It comes fully built and tested with a complete money back Guarantee.

KAYDE FLEXIBLE RIBBON CONNECTOR

£12.95 inc VAT

Stops movement of RAM PACK and other accessories
(Not needed with a *KAYDE* RAMPACK)

KAYDE 4K GRAPHICS BOARD

£29.95 inc VAT

The *KAYDE* Graphics Board is probably our best accessory yet. It fits neatly inside your ZX81. It comes complete with a pre-programmed 4K Graphics ROM. This will give nearly 450 extra graphics and with there inverse makes a total of over nine hundred.

The *KAYDE* Graphics Board has facilities for either 2K or RAM (for user definable graphics) 4K of ROM or our 4K Tool Kit Clips that will be available shortly. All the graphics are completely software controlled, therefore they can be written into your programmes. Here are a few examples: **A full set of space invaders — Puckman — Bulits, Bombs — Tanks — Laser Bases and Alien Ships.**

NO EXTRA POWER NEEDED

KAYDE 16K GRAPHICS BOARD SOFTWARE

£5.95 EACH

Peckman: The only true ZX version of the popular arcade game.
Centipede: "In all I think this is the best presented moving graphic program I've yet seen" Phil Garratt, Interface.
Space Invaders: The best version available anywhere.
Graphic Software can only be used with a Graphics board.

KAYDE 16K 81 SOFTWARE

£5.95 EACH

Centepede "In all I think this is the best presented moving graphics program I've yet seen" Phil Garratt Interface.
3D/3D Labyrinth. A Cubit Maze that has corridors which may go left, right, up, down.
Peckmen (the latest addition in 81 games).

WHY WAIT TO PAY MORE
FAST IMMEDIATE DELIVERY

Post to:
Dept SU
Kayde Electronic Systems Ltd
The Conge
Great Yarmouth
Norfolk NR30 1PJ
Tel: 0493 57867 (Dept SU)

Don't Forget you can always order on the telephone with your credit card

All products include VAT all hardware comes fully built and tested with a 14 day money back option

Access

VISA

DEPT.
SU5

I enclose £.....

Name .....

Address .....

.....

.....

Please add £1.50 P/P for all hardware and 50p for all software.
Please make cheques payable to Kayde Electronic Systems Ltd.